

**ENVIRONMENTAL RESPONSIBILITY,  
FINANCIAL PERFORMANCE, AND  
THE GREEN SUPPLY CHAIN MANAGEMENT OF  
JAPANESE AUTOMOTIVE COMPANIES**

**by**

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Beppu, September 2013

Wishnu Agung Baroto

## **DECLARATION OF ORIGINALITY**

I, Wishnu Agung Baroto, hereby declare that, this thesis is my own work and has not been submitted in any form for the award of another degree at any university. Information derived from published or unpublished work of others has been cited or acknowledged appropriately.

September 2013

Wishnu Agung Baroto

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## **ABSTRACTS**

The practice of the green business has been increasing during the time. Triggered by the demand of more environmental friendly products and services, companies' engagement in environmental responsibility is flourishing in Japan. This practice standardized by the Ministry of Environment in the Environmental Accounting Standard, which proposed cost and benefits measurement in environmental responsibility operations.

Regarding to the environmental responsibility practice in Japan, this research aims to (1) investigate the existence of relationship between environmental responsibility and financial performance in Japanese manufacturing industry, (2) determine the directional relationship (if any), and (3) explore the relationship among industry in Japanese manufacturing industry as green supply chain perspective.

Japanese manufacturing industry observed in this research are automotive, automotive spare-parts, and chemical industry. Those industries are significant in Japan as comprise a majority of companies and a key contributor to Japan's economy. Thus, it portrays green supply chain management, as the automotive industry is the front line industry supported by automotive spare-parts industry as the biggest supplier, and chemical industry as the upstream industry, which provide raw materials.

Using panel data regression to examine eight automotive companies, 10 automotive spare-parts companies, 10 chemical companies' financial performance

data from 2003-2012 and environmental responsibility in the similar timeframe, by the virtue of slack availability of resources, the impacts of financial performance on environmental responsibility were examined. Then, the direction reversed to explore the resource-based view perspective. Additionally, granger causality performed to investigate the existence of the equal bi-directional relationship between variables.

Statistically, the results suggest the existence of mix relationship of environmental responsibility and financial performance in the Japanese automotive automotive spare-parts, and chemical companies. Automotive companies exhibit the most virtuous cycle in the relationship of financial performance and environmental responsibility while other industries show more evidence to support the slack availability of resources. Moreover, as a green supply chain perspective, unarguably that automotive companies, automotive spare-parts companies, and chemical companies create a green supply chain.

**Keywords:** *environmental accounting, environmental responsibility, financial performance, virtuous cycle, sustainability, Japanese manufacturing*

# **CHAPTER 1**

## **INTRODUCTION, DEFINITION, AND THESIS STRUCTURE**

### **1.1. Research Background**

As the economic perspective shifted to the green economy, which indicated by increasing in demand on environmental friendly products, businessperson should answer this green business challenge by not only pursue for profitability but also sustainability purpose. The terminology of green business had been defined by many scholars in the sustainability research. One of the definitions was proposed by Cooney (2009), which described green business as inclusion of four environmental attributes in a business: principle of sustainability consideration in business decisions, produce an environmental friendly products and services, greener operations than other competitors, and commitment in business operations.

Those characteristics have to be informed to the stakeholders of the company using an environmental report. This report, which usually combines with social report, has several names such as corporate social responsibility (CSR report), social performance report, and sustainability report. As a tool for a company's environment responsibility disclosure, this report is notable because the more quantifiable environmental disclosures associated with better

environmental performance and economic performance (Al-Tuwaijri, Christensen, & Hughes II, 2004). Therefore, by virtue of the importance of an environmental report, standardize environmental report need to be addressed for easiness comparison and measurement.

In Japan, standardization of environmental accounting was started in 2000 when the Ministry of Environment of Japan released an environmental accounting standard. This standard established to accommodate developments of environmental accounting practice in companies. Therefore, environmental responsibility done by any companies can be easily compared because of it is standardized. As a result, the standardized and comparable reports increase the accountability performance, which helps companies boost public trust and confidence (Ministry of the Environment, 2005).

As the purpose of the standardized environmental report was to accommodate developments of Japanese companies, the Japan Association of Corporate Executives (JACE) in 2002 surveyed the awareness of social report and social action of Japanese companies. As mentioned by Umeda (2005), the survey explained that only 3% companies had CSR programs, but more than 29% are engaged in voluntary CSR. This phenomenon reflected the necessity of the regulation because not all the companies engaged in CSR has published their reports. Additionally, a report from Keizai Doyukai (2010) showed an increase of companies who believe that CSR is belonged to the core of the management

from 51% in 2003 to 71% in 2010. The surveyed also mentioned that companies who believe that CSR is a burden decreased from 65% to 51% in 2003 and 2010 respectively. This observable fact describes the changes of companies' paradigm of CSR, hence its changes their attitude. These reports show the changes in social responsibility of companies in Japan for the last decade.

The Japanese perspective of social responsibility has been investigated by numerous researchers. The result apparently showed except the bank sector, all industries in Japan agreed that the most critical issue in social responsibility is the environment. Wokutch (1990) mentioned in his research that the evidence showed participation in environmental activity is the major social movement among industries in Japan. Demise (2006) also pointed out the most important of the Japanese companies' consideration in environmental activities.

The Japanese companies' agitation in negative effects to the environment has always been part of the companies' concern due to Japan environmental problems experience. For example, the Minamata disease in Kumamoto reminded Japanese companies of the importance of environmental consideration (Demise, 2006). Consequently, environmental regulation were established by the Japanese government. As Iwata and Okada (2011) mentioned in their research, government regulated the natural resources preservation and abatement cost of pollutant to minimize negative effects of companies operations to the environment. At the time being, the companies recognize the participation into

environmental as an essential strategy in international trade. Keizai Doyukai (2009) reported that massive compliance in environmental responsibilities as a result of companies' strategy for pursuing competitive advantages. Therefore, it is believed that environmental responsibility management has become an indispensable business strategy of Japanese companies. Moreover, it allows companies continuing the environmental accounting practice and create more environmental friendly products.

Environmental responsibility as a business strategy has been researched by various scholars in different approaches. The positive impacts of environmental regulation to the companies' financial performance (Porter 1990; van der Linde 1993; Porter and van der Linde 1995; Rassier and Earnhart 2010) would be an explanation of companies rationale in environmental responsibility. Moreover, scholars argued that environmental responsibility has positive impact on companies' financial performance (Cochran and Wood 1984; Orlitzky 2008; Nakao et al. 2005; Nakao et al. 2007; Cortez and Cudia 2012).

Environmental responsibility and financial performance in Japanese manufacturing companies are the basic idea of this research. The reason of the decision to select manufacturing companies is based on the previous research manufacturing companies have a bigger responsibility to engage in environmental activities (Fujii et al., 2009). Furthermore, knowing that environmental regulation in Japan were established and environmental



accounting standard existed for more than a decade, this research intended to explore more on the relationship between environmental responsibility and financial performance in Japanese automotive industry, automotive spare-parts industry, and chemical industry.

Automotive industry in Japan is one of the most earlier adopter of environmental accounting, even when the regulation has not been developed. The reason of why they were doing the environmental responsibility because they believed that the environment is important, particularly considering the effects of their operations (JAMA, 2013).

The automotive spare-parts industry as a main supplier of the automotive industry has a close relationship to the automotive industry. Therefore, more or less, the automotive spare-part industry influenced by the automotive industry's environmental responsibility.

Chemical industry in Japan also significantly contributes in environmental accounting practices. Taking into consideration that chemical companies create a chemical substance that are being used by other industries in a supply chain, chemical industries have to be in a part of the automotive industry green supply chain. Thus, it is believed that the relationship is existed.

Considering the importance of the financial performance and environmental responsibility in managing a company as mentioned before, it is necessary to examine the relationship between the financial performance and

environmental responsibility in a company. This research tries to elaborate that relationship in Japanese automotive companies, automotive spare-parts companies, and chemical companies to depict the green supply chain management of the automotive industry.

## **1.2. Research Questions**

The fundamental question in this research is whether undertaking environmental responsibility in Japan delivers financial advantages for companies or vice versa. To comprehend this question, several questions are addressed as the following.

1. Is there any relationship between environmental responsibility and financial performance in Japanese automotive companies, automotive spare-part companies, and chemical companies?
2. What is the direction of the relationship (if any) between environmental responsibility and financial performance in Japanese automotive companies, automotive spare-part companies, and chemical companies?
3. What is the relationship between Japanese automotive companies to automotive spare-part companies and chemical companies related to the green supply chain management?

### **1.3. Research Objective**

Based on the research background and research questions above, the objective of this current study is to determine the relationship between financial performance and environmental responsibility in Japanese automotive companies, automotive spare-part companies, and chemical companies. Once the relationships are established, the direction will be determined to illustrate the green supply chain of Japanese automotive companies.

### **1.4. Significance of the Research**

- a. Theoretical usefulness: as a supplement the study in sustainability, green supply chain management, and environmental accounting. Moreover, this research also confirms the theories of sustainability.
- b. Practical usefulness: as an input for companies to manage their environmental responsibility, environmental accounting, and green supply chain management for their sustainability practice.
- c. As a reference for future research.

### **1.5. Thesis Structure**

The structure of this research starts from the introduction to the conclusion of the research. The description of each chapter is described as follows:

Chapter 1: Introduction, definition, and thesis structure

This chapter describes the research background, research questions,

research objectives, thesis structure, and limitation of study.

#### Chapter 2: Overview of the observations

This chapter explains a short description of the industries' observation especially regulation related to the industry.

#### Chapter 3: Review of literature

Chapter 3 illustrates the review of previous studies related to the environmental accounting, financial performance and environmental responsibility, and the green supply chain management.

#### Chapter 4: Theoretical framework and hypothesis

Theoretical framework in chapter 3 portrays the basic theory of this research, and it is followed by hypotheses formulation as an extension of research questions.

#### Chapter 5: Data and research methodology

This chapter describes data collection and methodology used in this research, and statistical descriptive test performed.

#### Chapter 6: Results and analysis

Chapter 6 depicts the analysis of statistical results related to the hypotheses.

#### Chapter 7: Discussions of findings and implication

This part discusses the results of the previous chapter more

thoroughly and explains the hypotheses.

## Chapter 8: Conclusion

This chapter is the conclusion of this research with suggestions for further research.

### **1.6. Limitation of Study**

This study tries to depict the green supply chain in the automotive industry. Then, in each industry, financial performance and environmental responsibility are explored to comprehend the relationship. However, this research only cover the the Japanese automotive companies, automotive spare-parts companies, and chemical companies, although it is believed those are significant in the automotive green supply chain. Furthermore, the discussions are focused on several variables which chosen based on the previous researches.

## **CHAPTER 2**

### **OVERVIEW OF THE OBSERVATION**

This chapter describes a brief explanation of the industry observed in this research. Industry description, regulation and other policies are explored to give a broader understanding of each industry. Additionally, more description in the automotive industry related to transformation of regulations in order to answer the challenge of economic change also discussed.

#### **2.1. Automotive Industry**

Based on Japan Automobile Manufacturers Association, Inc. (JAMA), there are 14 Japanese automotive manufacturers in Japan. Those 14 companies supported by more than hundreds companies as suppliers of automotive parts, which totally 20.000 to 30.000 parts for one car (JAMA, 2013). As an integrated industry, automotive industry becomes one of the Japanese economy's core industrial sector that contribute 16,4% of the total value of Japan's manufacturing shipments (JAMA,2013). Therefore, considering the role and contribution of the automotive industry, government established environmental policies to protect the environment but also nourishing the industry.

##### **2.1.1. Emissions policies**

Reducing CO<sub>2</sub> emissions and other greenhouse emissions has been mentioned in the Kyoto Protocol in 1997. Therefore, Japanese government

established a target achievement plan in 2005 (revised in 2008) to promoted CO<sub>2</sub> reduction measurement in all vital sectors including the automotive industry.

In the automotive sector, target of CO<sub>2</sub> emissions in 2010 was around 240-243 million tons. However, in 1998, 264 million tons CO<sub>2</sub> emissions were produced from the transportation sector. JAMA estimated the CO<sub>2</sub> emissions became 300 million tons in 2010 if no action in reducing emissions. Three countermeasures declared by Japanese government for solving this environmental problem are: increase vehicle efficiency, improve traffic flow, and other measurement such as promotes fuel-conserving eco-driving.

The results of those countermeasures were reduction of estimated CO<sub>2</sub> emissions to 58.67-60.16 million tons in 2010. This result was lower than the targeted emissions (JAMA, 2013).

### **2.1.2. Recycling policies**

The regulation related to recycling policy in Japan is the Japan's End-of-Life Vehicle (ELV) Recycling Law. This law defines responsibilities of automotive-related business to construct a recycling system, reduce waste disposal, and the use of recyclable resources (Environment Centre Foundation, 2011). As a regulation that was publicized in 2002, the enforcement just has been fully implemented in

2005.

The main point of this law is the requirement for all end-of-life vehicles to be disposed and recycled. The obligation goes to the automotive producers with collaboration with their related-business companies. Therefore, a system was established to ensure the collection, recycle, and treatment for the unused cars (Toyota Corporation, 2013).

### **2.1.3. Tax policies**

Japanese government established environmental policies related to car market to answer the increasing concerns of the car industry effects on the environment. The policies were intended to the car buyers in the form of tax reduction and eco-cars subsidy either in prefectural tax or national tax (JAMA, 2013).

There are three taxes related automobile regulated by the government: automobile tax, acquisition tax, and tonnage tax. Automobile tax is a prefectural tax that paid annually car, bus, and truck owners. Another prefectural tax related automobile is acquisition tax, which applied once when someone acquire a car. Those taxes along with tonnage tax, which is paid by the vehicle owners every two to three years as a compulsory safety inspection, are taxes related to automotive in Japan (Aichi Transport, 2013).



1. Year 2005

The regulation divides cars into two categories: gas-vehicle and hybrid vehicle. Explanation for each category had been summarized by Kitano (2012) in the table below.

Target	Gas-vehicle		Hybrid-vehicle
Emissions down by 75% from 2005 standards	Automobile tax: 50% reduction Acquisition tax: 300000JPY deductible Tonnage tax: none	Automobile tax: 25% reduction Acquisition tax: 200000JPY deductible Tonnage tax: none	Automobile tax: 50% reduction Acquisition tax: 44% reduction Tonnage tax: none
Emissions down by 50% from 2005 standards	Automobile tax: 25% reduction Acquisition tax: 200000JPY deductible Tonnage tax: none	None	-

Table 2. 2 Japan's car market policies in 2005

Source: Kitano (2012)

Table 2.1 describes Japan regulation related to the automotive industry in 2005. Buyers would get some incentives if they bought cars that categorized as eco-cars. Gas-vehicle has two categories and different tax treatments. First, cars performing 4% better or more compared to 2010 target fuel-economy-standards get 50% automobile tax reduction and 300000JPY acquisition tax deduction. Another category for cars meeting 2010 target fuel-economy-standards benefited from 25% automobile tax reduction and 200000JPY acquisition tax deductible.

Furthermore, buying hybrid cars also gives some incentives as long as the cars are able to meet 120% of 2010 target fuel-economy-standards. Buyers would be benefited by 50% automobile tax reduction and 44% acquisition tax reduction.

Those regulations were started in the fiscal year 2005 and revised in year 2006, 2008, and 2009.

## 2. Year 2006

In the year 2006, several changes related to the regulations were announced. Starting this year, only 75% emissions down from 2005 were benefited. Therefore, if the cars were able to reduce only 50% of its emissions, no incentives until it reach 75% emissions reduction.

The categories of gas-vehicle fuel-economy certification also changed significantly. In 2005, the car that performs 4% better or more compared to 2010 target fuel-economy standards would be rewarded with 50% automobile tax reduction and 3000000JPY acquisition tax deductible. In 2006, to obtain similar incentives, the cars should achieve 120% of 2010 target fuel-economy standards. The second category also changed the minimum requirement by increase 10% of 2010 target fuel-economy standards.

## 3. Year 2008

In the year 2008, the fuel-economy certification changed both in gas-

vehicle and hybrid-vehicle. Gas-vehicle categories became higher from 10% and 20% above 2010 fuel-economy standards target to 25% and 15% in 2008.

#### 4. Year 2009

In 2009, Japanese government established a regulation of tonnage tax for eco-cars as shown in table 2.2.

Target	Gas-vehicle		Hybrid-vehicle
Emissions down by 75% from 2005 standards	Automobile tax: 50% reduction	Automobile tax: 25% reduction	Automobile tax: 50% reduction
	Acquisition tax: 75% reduction	Acquisition tax: 50% reduction	Acquisition tax: 100% reduction
	Tonnage tax: 75% reduction	Tonnage tax: 50% reduction	Tonnage tax: 100% reduction

Table 2. 3 Japan's car market policies in 2005

Source: Kitano (2012)

Based on the table above, significant changes were made in 2009.

Tonnage tax as a national tax in Japan became an incentive for the cars buyer. Furthermore, acquisition tax also changed from monetary basis to percentage basis, which would more flexible in the application.

#### 2.1.4. Effects of the tax policies

Kitano (2012) research on environmental policy in the Japanese car market showed automotive companies gained benefits from the environmental policies, mostly gained by Honda and Toyota. Toyota as the biggest hybrid-car producer in the world gained more benefit than any

other company did in 2005-2010. Kitano's result is naturally expected because one of the reasons of this rulemaking is to promote the environmental friendly cars for the consumer and stimulate them to shift from "general" cars to eco-friendly cars. Therefore, automotive companies gain more profit because they can sell more cars; and as a result, increase their profits.

## **2.2. Automotive Spare-parts Industry**

The automotive spare-parts industry in Japan is one of the most influential industries to support the Japanese automotive industry. Over than 13 trillion yen, auto parts shipments to support the car making, not only in Japan but also around the world (JAPIA, 2013).

The history of this industry started after the boom of the automotive industry in Japan. In the past, most of the automotive spare parts companies are belonged to or tighten to a particular company. However, the business model was changed to for the virtue of competitive advantage and creates an invisible handshake between the automotive industry and automotive spare parts industry (Smitka, 1990).

Related to the policies and regulations, as the industry is closely related to the automotive industry, the policies and regulations are similar with the one in the automotive industry. This industry has to comply with the Japanese CO<sub>2</sub>

emissions policy, recycling and waste disposal regulations.

### **2.3. Chemical Industry**

Understanding the definition of chemical industry is ambiguously due to a broad range of this industry's types. The most comprehensive definition of chemical industry was defined by Yoshiro Tokuhisa in Japan Chemical Industry Association's report (JCIA, 2010) as the following.

*“It is the industry that manufactures various products from various raw materials for various purposes by using primarily chemical technologies. However, like steel, those which are categorized separately are excluded.”* (Mr. Yoshiro Tokuhisa, “Is there a future for the chemical industry?” published by Nikkei Inc.)

In 2010, the total shipments of chemical products are approximately 44 trillion yen, which ranks the second largest after transportation machinery among all Japanese manufacturing industries (JCIA, 2010). This shipment consists of thousands types of products, such as plastics, fertilizer, etc.

Regarding to the environmental responsibility, the Japanese Ministry of Economy, Trade, and Industry (METI) promotes 3Rs as a balance between the environment and the economy. The term 3Rs is an acronym for reduce, reuse, and recycle. This policy, together with other regulations, regulates the chemical industry in Japan.

### **2.3.1. Chemical substance control**

The purpose of this law is to prevent human and the environment that caused by chemical substance released. The law requires chemical companies to control, manage, and report their chemical substance production. (METI, 2013) Therefore, the companies should prepare more investment to comply with this regulation.

### **2.3.2. PRTR system**

PRTR stands for Pollutant Release and Transfer Register. This system requires companies to notify every chemical substance released or transferred to the environment. In Japan, it was adopted in 1999 under “The Law Concerning Reporting, Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management” (Ministry of the Environment, 2013).

According to the Ministry of Environment (2013), the advantages of adopting the PTPR system are an improvement of chemical substance management, increase of education, and development of local residents.

### **2.3.3. Responsible care**

Responsible care is an effort of chemical industry to preserve health, safety, and the environment. It was established in Canada in 1985, then Japan adopted in 1995 when Japan Responsible Care Council (JRCC) was established. Recently, the JRCC was merged with JCIA and became one of the Responsible Care Committee of the Japan Chemical Industry Association (JCIA, 2013).

Based on the explanations above, Japanese automotive, automotive spare-parts, and chemical industry are regulated for the purpose of sustainability. Chemical industry as the upstream industry for the other industries has a different regulation compare with the other two industries. This is happen because of chemical industry has a different type of manufacturing industry in Japan. However, all of the industry is regulated in terms of waste and CO<sub>2</sub> emissions. Taking into account of this fact, companies' waste disposal management and CO<sub>2</sub> emissions should considered as companies' environmental responsibility. Moreover, automotive industry also has different regulation related to the products. The Japanese government gives incentives to the company (by tax reduction) and cars buyers (by subsidize). According to Kitano (2012), companies gained benefits from the environmental policies, especially Honda and Toyota as the biggest hybrid cars producer in Japan.

## **CHAPTER 3**

### **THEORETICAL PERSPECTIVE**

The first part of this chapter explains the theory of environmental responsibility as part of Corporate Social Responsibility theory. Then it is followed by a discussion of financial performance and environmental responsibility theory. The last part is the green supply chain theory. All of the theories beneficial in construct the hypotheses in the following chapter.

#### **3.1. Corporate Social Responsible Theories**

Environmental responsibility as a part of corporate social responsibility as far had been explained by using four theories. In the Oxford Handbook of Corporate Social Responsibility, Mele (2008) explained the evolution of the theory methodically; thus, this sub chapter is in debt by his works.

##### **3.1.1. Corporate Social Performance Theory**

Mele (2008) explains that Archie B. Carroll was the first scholar who suggests the theory of corporate social performance. Carroll argued the existence of social responsibility and the attitude of business responses to social concerns. Sociologically, company is responsible for the social problems caused by the activities or operations of the company. Thus, company has to enact the policies and principles as responds of the social requirements. Carroll (1979) proposed a ‘Pyramid of Corporate



Social Responsibility” that consists of four categories: economic, legal, ethical, and philanthropy.

During the time, supports of this theory appear and even expand the original theory. Warwick and Cochran (1985) believed that a company engages in a social contract and moral agency. Hence, economic responsibility is one of the elements of social responsibilities. Engaging in environmental responsibility, companies will be measured by how the company assembles philosophical orientation, institutional orientation, and organizational orientation. Furthermore, another noteworthy contribution related to the theory was proposed by Wood (1991). He describes three level analysis of social responsibilities into three institutional, organizational, and individual. His framework influences most scholars to follow and becomes a most widely used framework in corporate social performance theory (Mele, 2008).

However, Mele (2008) noted the advantages and disadvantages of the corporate social performance theory. He mentioned that the coherency of the theory’s structure promotes further studies to take advantages for examining the business and society relationship. On the other hand, the disadvantages are lies on the tranquilly ambivalent in the implementation process might exist; therefore, scholars mostly combine this theory with the stakeholder perspective to reduce the ambiguity

(Mele, 2008). The second disadvantage is lack of ethnics-normative aspects and business activities in this theory. As cited from Freeman and Liedtka, Mele (2008) argued that corporate social performance seems to propose capitalism with separation of economics and ethics.

### **3.1.2. Shareholder Theory**

Mele (2008) mentioned that shareholder theory argues that profits and maximum wealth of the shareholders are the only social responsibility of business. Milton Friedman is the well-known representative of this theory. The argument is based on the neoclassical economic theory that believes a company can do activities as long as it is tranquil with the laws or the activities able to contribute to shareholders maximization. This theory sees that engaging in environmental responsibility might decrease shareholder value creation, due to the task should be done by the government, and should not become a companies' task (van Marrewijk, 2003).

Mele (2008) noted Friedman's argument of a company as an artificial person; thus, regulation and laws also authorize the rights and duties of the company as a 'person'. It creates a potential conflict between the shareholders and manager; and might be seen as a indication of an agency problem (McWilliams and Siegel, 2001). Relationship between shareholders and manager puts the shareholders as the owners of

the company and managers are the agent. Additionally, owners require managers to prioritize the creation of shareholder value in order to sustain the companies' well being.

In this theory, there is a controversial assumption: 'a full separation of the function of the public and private spheres' (Mele, 2008). The theory suggests that a corporation is a private and covers self-governing activities aimed for wealth-creation. Meanwhile, other responsibilities related to the supply of public goods, are should be done by the government. As a result, the corporation does not responsible for the effects of business activities, unless it is legalized by the regulation. Accordingly, the 'social objectives' may have three assumption. First, it implies that managers' activities are on categorized as shareholder cost. Second, it assumes that CSR existence was an agency problem. Managers believe think that misusing corporate resources to achieve non-profit orientation never become better than spending those to improve value-added of the shareholders. Third, it also a sign that manager utilizes CSR as a tool for their self-objectives, for example, achieving their personal agenda for careers.

Considering the position of managers as an employee, they have a responsibility to manage and the owners' resources. Therefore, standard of fulfillment of the owner's needs should be set in order to satisfy them.

Regarding to this matter, Milton Friedman argued, “the only one responsibility of business towards the society is maximizing profits to the shareholders, within the legal framework and the ethical custom of the country” (Mele, 2008: p. 55). As a result, corporate governance’s role is made for support the shareholders’ interests; then the managerial systems are designed to maintain efforts of profit maximization.

In the view of principal-agent theory, the debates of shareholder value in social responsibility study never become reaching the end. Van Marrewijk (2003) mentioned that this approach can be seen that social responsibility is important as long as it can maximize the benefit of the company. Therefore, this argument evokes the use of other approaches to examine the business and social relationship. For example, the resource-based view perspective suggests that a company is a social player in the community whereas the tangible and intangible resources/assets are managed and utilized to add value. When the company engages in the social responsibility, it is consider as an investment for the future expectation. Therefore, social responsibility is used by the company to improve their resources. As a result, companies’ social activities become a means of knowledge enhancement, increase a corporate culture, and increase the reputation of the company, which able to contribute to achieve a competitive advantage and increase sales (Branco and

Rodrigues, 2008). The example shows an illustration of the use shareholder theory as one of the theories to express the phenomenon of social responsibility.

It is believed that shareholder theory supports the advantages of economic wealth creation. Profits set by the shareholders approach allows the company to performing the innovations, cutting cost, producing products with higher economic added value, investing on projects, and the last, maintaining the company's competitiveness of the market. Therefore, government has a role to minimize inequalities in the market and the most famous are enacting regulations to prevent the negative impact of business operations (Mele, 2008).

However, this approach also criticized by several scholars for some reasons. First, economic growth created by shareholder theory did not show the real achievement. In the view that the company's profits increase but scarifying the natural resources and exploiting their workers, the creation of economic value reflects the short-term profits only. This approach would neglects the needs of employees, customers, suppliers, local communities and other stakeholders. Secondly, substantially the regulation seems unable to regulate the company's behavior effectively.

It seems that regulation is powerless to oppose everything in business life (Mele, 2008).

### **3.1.3. Stakeholder Theory**

The second approach is the stakeholder theory, which considers the presence and the influence of stakeholders who have claims on the company (Mele, 2008). Mele (2008) also mentioned that stakeholders can be defined as individuals or groups that obtain benefits from or are harmed by corporate actions. In the previous section, the shareholder theory urges managers for prioritizing profits maximization for the shareholders, however, in the stakeholder theory, the value creation is aimed to a wider range of stakeholders. Jones (1995) explained the Freeman's model in 1984 as the most important postulation of the stakeholder approach. This model considers some issues: 1) what are managers do to maintain relationships with stakeholders, 2) what are the consequences if managers maintain the stakeholder management principles, and 3) what managers should do when dealing with the stakeholders. This theory clearly suggests that companies have responsibilities to all the parties influenced by positive or negative business activity; that is called as a responsibility to the stakeholders of the firms (Mele, 2008).

Mele (2008) revealed the strength and weakness of stakeholder theory. The main advantage is the consideration to respect human rights

and environmental responsibility. The idea is to adopt social responsible concept as a management strategy to achieve various goals, not only profits orientation. However, some arguments oppose the theory by stress the idea of this theory is a suggestion of socialism perspective applied in the business. Another critique is the need for balancing all the stakeholders' interest make corporate objective becomes unspecific. The reason is once stakeholder theory is applied, stakeholder management would contradict with the shareholder oriented, in the sense of value creation is a pro-shareholders goal, not for stakeholders. As a result, Mele (2008) suggests that the need of scholars to improve the normative stakeholder theory. However, the stakeholder theory contributes to explain the business-society relationship.

#### **3.1.4. Corporate Citizenship**

Another theory related to the social responsibility is pointed out by Mele (2008). Even though, he argues that this theory, called the corporate citizenship was a different concept of social responsibility, current studies believed that both terms are similar. Mele (2008) argued that corporate citizenship is more innovative than social responsibility. As business becomes an essential part of the society and social responsibility is more referring to social actions, the terminology of 'citizenship' used subject to an individual who has duties and rights. Therefore, as a citizen, a company

has rights, responsibilities, and partnerships with societal groups and institutions. Mele (2008) argued that corporate citizenship is to understand how business should act to respect the stakeholders. A Company is not considered having a social responsible unless its behavior falls in a certain way according to the law. In the other words, a good corporate citizen would behave to its stakeholder for some reasons.

The theory of corporate citizenship also has advantages and disadvantages. Mele (2008) explained several strengths of this theory. The first advantage is the concept of ‘business ethics’ and ‘social responsibilities’ in the contrary with the business for profits. Consequently, corporate citizenship is more appropriate to refer the ability of companies to develop a relationship with other member of society. Second advantage is the ability of the theory to answer that the social responsible action would lessen profits. Based on this theory, the managers able to pursue for profits without disrespecting human rights and undervaluing social purpose. Third is that the citizenship theory similar with the social philanthropy. On the other hand, criticism of the theory is because of measurement of the effectiveness is difficult to measured because of it contains various interpretations and topics.



### **3.1.5. Institutional and Legitimacy Theories**

Another theories which also important, but were not explained by Mele, are mentioned by Cortez (2011); the legitimacy theory and institutional theory. Campbell (2007) suggests the institutional theory to explain the institutional system behavior in social responsibility. This theory argues that institutional conditions, such as state regulations, are getting more powerful; therefore, they tend to force the company to behave more responsible. Then, the conditions create a set of institutions, either politic or economic, where the companies exist and operate their businesses.

Legitimacy theory aims to explain the idea of a company contract with the society. As companies agree to perform various social responsibility actions in return for the approval of the operation, they need to disclose any social information sufficiently. Therefore, the information used by the society to assess whether the companies has a good corporate citizenship or not, and to legitimize further existence (Guthrie and Parker, 1989). Other scholars applied the legitimacy theory to analyze the phenomenon of corporate social reporting and also the rational background of the actions (Cortez, 2011).

### **3.2. Environmental responsibility and financial performance theories**

Barney (2001) mentioned that resource-based view perspective and slack availability of resources perspective are the basis of sustainability study. The resource-based view perspective is the basis for environmental responsibility impact the financial performance and the slack availability of resources are the vice versa (Cortez & Cudia, 2012).

#### **3.2.1. Resources based view perspective**

Tracing to the origins of resources-based view, Penrose (1959) have suggested that a firm's resources, either tangible or intangible or both, influences the capability of a firm to expand its business. She argued that a firm is a collection of productive resources and has to transform a short-term competitive advantage to a more sustained advantage requires resources to be utilized. Her suggestion evolved during the time Wernerfelt in 1984 and Barney in 1986 write two most influential publications of the resources-based view. While Wernerfelt (1984) argues that the positive relationship between profitability and resources, Barney (1986) as the father of the modern resources-based view emphasize on strategic resources allocation to maximize returns.

Barney (1991) proposed the abnormal rents from resources can be earned if the resources are valuable, rare, imperfectly imitable, and non-substitutable. *Valuable* means that the resources should enable the

company to employ a value-creating strategy. This can be achieved by better performance compare the competitor or reducing weaknesses. *Rare* refers to the scarcity of the resources. The more scarce of the resource is the higher price reflected in the future. *In-imitable* resources reflected to un-duplicated resource, knowing that the valuable resource can be a source of competitive advantage. *Non-substitutable*, as the last criteria, requires the non-substitutable of a resource. Even that resource is rare, value creating potential, and in imitable, the competitors would not able to counter with the substitutable resources unless the resource has a substitute.

The proposed conceptual framework of integration between resources and competitive environment for company performance are starting from the internal resources and environment, driven by the awareness and motivation of sustainability; then, creates a competitive advantage for a better firm's performance.

The resources-based view perspective has been an essential theory to justify the impacts of environmental responsibility impacts on the financial performance of a company (Cortez, 2011).

### **3.2.2. Slack availability of resources perspective**

Slack availability of resources or commonly mentioned by the organizational slack is simply defined as a resources that are under-

utilized, which means that not all the company resources are allocated to provide maximum wealth (Penrose, 1959; Damanpour, 1987). Seeing from the competitive advantage of the company, under-utilized resources indicate a gap in the competitive advantage, which provides an opportunity for the company to invest and innovate (Bromley, 1991; Finch, 1991). The investment and innovation by in the end create a long-term performance.

Following the basic theories of slack availability of resources, there are theories as the conceptual roots of slack resources as a potential force for sustained competitive advantage (Adkins, 2005).

1. The classical strategy concept

This theory lies on three basis ideas, a commitment on short-term profit, rational analysis, and separation of guidelines formulation and implementation. In this paradigm, idle resources viewed as an asset that should provide returns to stakeholders (Chandler, 1962; Ansoff, 1965 as cited in Adkins, 2005).

2. The evolutionary paradigm

This approach in contrast with the classical theory because suggests that planning has little consequence in sustainability (Henderson, 1989 as cited in Adkins, 2005). He argues that market will select the best company and neglect the inefficient. Market approach makes company

has to evolve by innovation and product development to achieve competitive advantages for sustainable business (Williamson, 1991; Sanchez & Sudharshun, 1992 as cited in Adkins, 2005). Thus, this paradigm is essential for the adaptation of slack availability of resources.

### 3. The processual or emergent strategy

This paradigm rejects the classical strategy concept and the evolutionary paradigm in the same time. The promoter of this approach believed that organization and environment are unpredictable (Weick, 1990 as cited in Adkins, 2005). This paradigm argues that absorption external environment, such as market pressure, and maintenance of flexibility of strategy, both are required for managing substantial slack of resources (Hambrick & Snow, 1977 as cited in Adkins, 2005).

Those paradigms are the basis of conceptual approach in the relationship between organization and external environment. Therefore, Barney (1991), Grant (1991), and Oliver (1997) argue that internal capabilities should be match with the external opportunities. However, difference between them should be managed to gain competitive advantage.

Waddock and Graves (1997) clearly reveal the basis of slack availability of resources as a theoretical background of social responsibility and financial performance. They mentioned that slack availability of resources creates an opportunity for companies to invest more in social performance, such as community development, environmental, and employee relations. Then, the more slack resources available, the better social performance would be performed by the allocation of the resources.

### **3.3. Green supply chain theory**

Zhu, Gen, Fujita & Hashimoto (2010) mentioned the four green supply chain management practices implemented in Japan: green purchasing, customer cooperation with environmental, eco-design, and investment recovery. Moreover, as Cortez (2012) mention that automotive and electronics companies require thousand global suppliers which comply with eco-friendly products; it is also considered as an establishment of green supply chain.

The green purchasing is the practice of choosing the greener supplier for product processing making. Managing the green purchasing would reflect the company's effort on environmental responsibility (EPA, 2013). Customer cooperation with environmental shows an environmental support by the customers based on their demand of the eco-friendly products. Eco design is related to the research and development of the product which mostly the most

important in Japan environmental policy (Zhu, et. al., 2010). The investment recovery points out the capability of the investment related to the management of environmental responsibility obtain a benefit by recycling activities (Ministry of Environment, 2005).

As a practice of green supply chain management, environmental responsibility performed by the companies especially in CO<sub>2</sub> emissions and waste reduction show the green supply chain in the business. Roy and Whelan (1992) worked in CO<sub>2</sub> reduction and waste management on green supply chain management. Other research point out that profitability and cost reduction has become company motivation to conduct green supply chain (Srivastava and Srivastava, 2006).

Other terminology of green supply chain has been defined by Emmett and Sood (2010) when mentioned that a green supply chain as a traditional supply chain management, including product design, procurement, sourcing and supplier selection, manufacturing and production process, logistics and the delivery of the final product to the consumers, management of end-of-life product, in environmental consideration. The areas covered by the green supply chain management are the upstream activities, downstream activities, business activities, and logistics activities. These areas are in line with the areas covered in Japanese environmental accounting guideline as mentioned earlier.

Emmett and Sood (2010) depict the difference between supply chain management and green supply chain management as shown in figure 3.1 and 3.2.

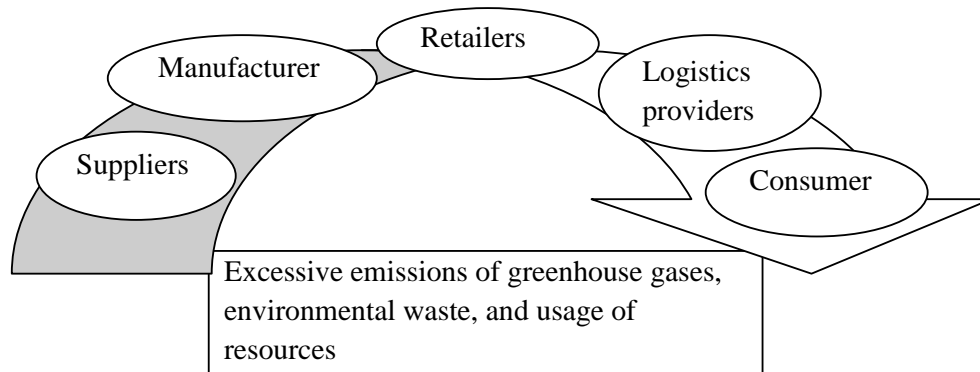


Figure 3. 1Traditional supply chain  
Source: Emmett & Sood (2010)

As shown in the figure 3.1, the flow of materials and information is linear and one to another. The environmental information could not transfer to other; therefore, each area only concern about his own area without considering upstream and downstream environmental performance (Emmett & Sood, 2010).

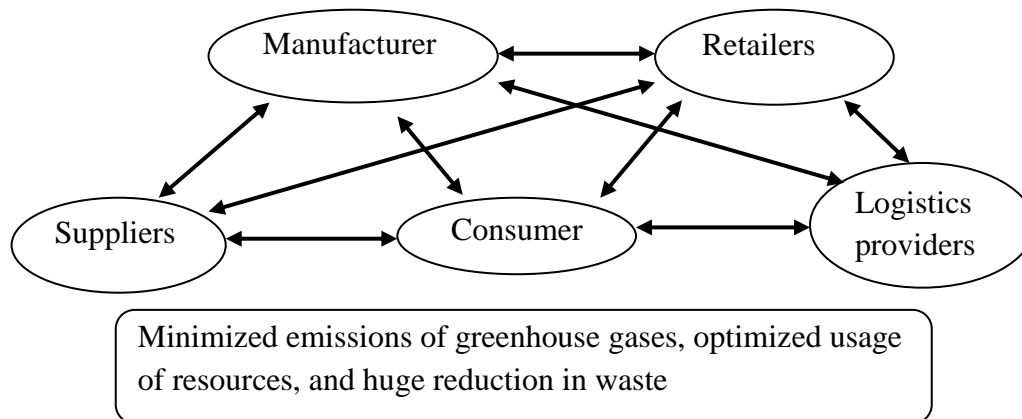


Figure 3. 2 Green supply chain  
Source: Emmett & Sood (2010)



According to their observation, green supply chain in the automobile industry can increase profitability up to 6% from design for disassembly, procurement cost reduction, material recycling, cost for disposing unrecyclable waste reduction, and lower maintenance cost (Emmett & Sood, 2010). On the other hand, chemical company also gains up to 3% of profitability improvement when the company conducts green supply chain management.

## **CHAPTER 4**

### **LITERATURE REVIEW**

This chapter describes previous studies on environmental accounting, environmental responsibility and financial performance relationship, green supply chain management.

#### **4.1. Environmental Accounting**

The Ministry of Environment of Japan in 2000 released a draft guideline of environmental accounting, which was revised in 2005 and 2007. The guideline triggered companies to establish their environmental assessment and measurement. (Study Group for Developing a System for Environmental Accounting, 2000). Moreover, this guideline was the first guideline, which aimed to help companies to achieve sustainable development, maintain community relationship, and obtain effective and efficient environmental activities (Ministry of the Environment, 2005a).

The guideline defines environmental accounting as a mechanism for quantifying environmental conservation activities (Ministry of the Environment, 2005b). This is important because companies need to quantify their operations into monetary measurement, which is more beneficiary for decision-making. Based on the guideline (2005), monetary measurement of environmental

conservation activities called as environmental cost, which classified into six categories (Ministry of the Environment, 2005b):

1. Business area cost

Cost related to the direct management of the impact on the environment during producing goods and services. For example, environmental cost related to the manufacturing process, sales, and distribution.

2. Upstream and downstream cost

Upstream cost is an environmental cost for the area prior to the business area cost, such as raw materials and supplies. While downstream cost is an environmental cost related to the output of goods and services, for example is consumption of product, emissions, recycling of waste.

3. Administration cost

Cost related to the process of administration of environmental responsibility. Including in this category is the cost of spreading information regarding of the environment.

4. Research and development cost

This cost related to the research and development of a company's business strategy. As accounting treats research and development cost into either capitalize as a fixed asset or as an expense, determining the environmental cost only reflects both account in a period.

However, some problems might arise in this category, especially to classify which cost is a cost-related to environment or not. Moreover, determine the timeframe of research and development might also become a problem.

5. Social activity cost

This cost is all the environmental cost that used to contributes to the society; for example is community development.

6. Environmental remediation cost

This cost is related to the companies' effort on remediate the negative effect to the environment caused by their operations.

The most important feature of the recent environmental accounting guideline is the environmental conservation effects and economical effects measurement in the report. This feature requires companies to determine their benefits of doing environmental responsibility. As a result, measurable and comparable environmental responsibility can be observed by implementing this guideline, which is necessary for the shareholders (Kokubu & Nashioka, 2003).

A study from Kokubi & Nashioka (2003) noted that the guideline influences companies' behavior for environmental responsibility disclosures. They pointed out that no significant difference in corporate size to implement environmental accounting. However, their research found the significant practical differences are exist regarding to the type of industry and related to how long the company implement their environmental responsibility disclosure. They

conclude that the Ministry of Environmental guideline has a significant impact on environmental accounting practice in Japanese companies (Kokubi & Nashioka, 2003).

## **4.2. Environmental Responsibility and Financial Performance**

Environmental responsibility and financial performance relationship has been researched for more than six decades. Researchers interested to establish this relationship because, in nature, these two aspects seem contradictory. As studies related to this topic evolve throughout the years, this subchapter aims to summarize them to give broad but concise understanding.

### **4.2.1. Environmental responsibility**

The social responsibility classical model was proposed by Milton Friedman, which argued the only social responsibility of business is to pursue profits (Friedman, 1962). His argument was derived from a free market economic system in which profit is the measurement of how efficient manager allocate the company resources to meet consumer demand. Thus, it is increase consumer satisfaction as a proxy of social responsibility. Consequently, this model denies the possibility of environmental responsibility, which actually occurs in business.

In order to answer the stakeholders' request, managers have to create a green product or an eco-friendly product. The company's involvement in creating more environmental friendly products can be mandatorily or

voluntarily. Klassen and McLaughlin (1996) mentioned that voluntary means companies doing environmental responsibility and establishes a policy initiatively. This behavior might gives an impacts on financial performance of the company because the initiative would recognize by the public would receive appreciation.

Another behaviour in environmental responsibiliy implementation is the mandatory implementation. This means that companies involve into environmental responsibility because of it is regulated by the government and it is a mandatory for them.

The justification of company behavior to performs environmental responsibility also mentioned by Lee (2011). He explained the motivation of environmental management based on the the stakeholders theory. He argues that stakeholders theory is the most important measurement to explains companies' behavior towards to environmental responsibility. (Lee, 2011)

#### **4.2.2. Financial performance**

Financial performance has been an important focus in the research of companies' performance (Barney, 2002; Richard, et. al., 2009). In the earlier years, researchers utilized accounting-based performance, such as Return on sales (ROS), Return on Assets (ROA), and Return on Equity (ROE) as proxies of financial performance. The more recent years,

market-based performance commenced as companies' financial performance measurement (Bromiley, 1990). However, both the financial performance has been accepted as the indicators of financial performances.

Accounting measurement generally related to the accounting profitability. Some of the most commonly used are ROA, ROE, and ROS. Using accounting measurement reflects the current company financial performance. On the other hand, market-based performance reflects future expectation on the company. Lubatkin and Shrieves (1986) believe that market-based performance is more superior to accounting-based performance. They argued that market reflects the future expectation of the company for a better predictor, and accounting measurement tends to be manipulate by the managers since it is manager's authority.

A study from Gentry and Shen (2010) describes the relationship between accounting-based measurement and market-based measurement. They argue that positive correlation exists between the measurements of financial performance. The noteworthy result from their research is their argument for future research of financial performance to combine both accounting and market performances but should not measures in a single financial performance because of the covariance of the relationship is low (Gentry & Shen, 2010).

#### **4.2.3. Environmental responsibility and financial performance**

The relationship between environmental responsibility as part of Corporate Social Responsibility (CSR) and financial performance always become an interest of managers because of environmental responsibility might affect to the profitability of the firms. Considering this activity as an investment, environmental responsibility can be seen as a tool for creating competitive advantage and profitability by value creation (Porter & Kramer, 2006). As the main purpose of a company is profitability, the focus of its operation is maintaining financial performance. However, company has to face with the environmental responsibility as concerned by the society or other stakeholders.

Regarding to the relationship between financial performance and environmental responsibility, and Jacobs et al. (2010) argued that environmental responsibility can improve companies' financial performance. They proposed that the financial performance from environmental responsibility could be generated in two ways: revenues and cost reductions as presented in the Figure 3.1.

Figure 4.1 depicts the flow of environmental responsibility to the financial performance. Jacobs et al. (2010) argued that environmental responsibility able to increase reputation and revenues of the companies. On the other hand, engaging environmental responsibility reduce the cost



of production, distribution, and avoidance. As a result, financial performance affected by the environmental responsibility

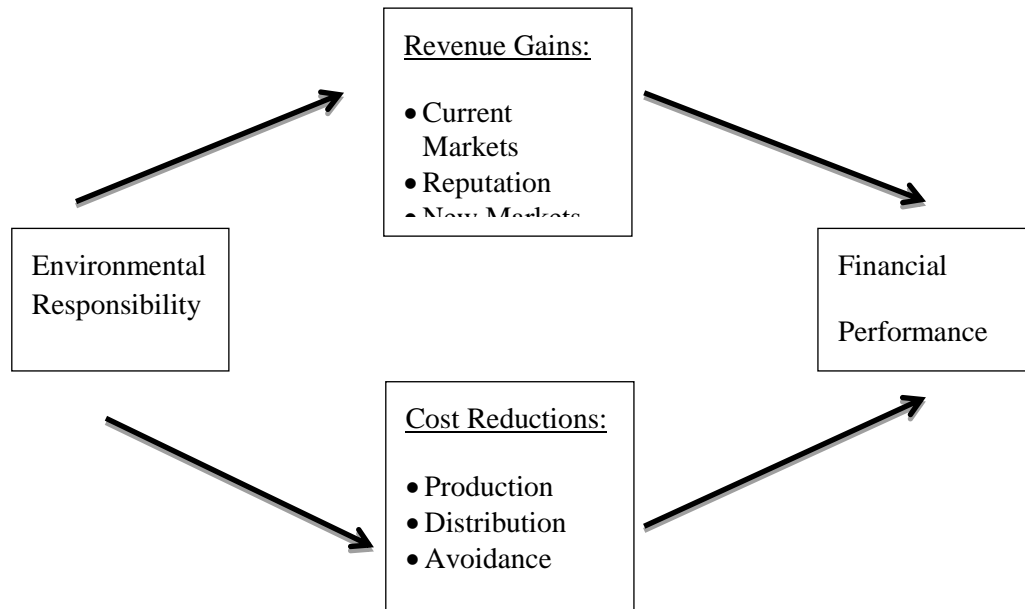


Figure 4. 2 Conceptual model to link environmental and financial performance  
Source: Jacobs et al. (2010)

Previous studies in environmental responsibility and financial performance relationship are described in table 3.1. The literature review explains in the table mostly apart from the literature describes in the previous chapter. Consequently, the number of literature review written would differ with the literature review observed for this research.

The table consists of the author and title of their works, the area of observation, methodology, and research variables to gives a clear understanding of literature related to environmental responsibility and financial performance relationship.

No.	Author & Title	Area of Study	Analysis Method	Research Variable
1.	Cordeiro and Sarkis (1997) <i>Environmental proactivism and firm performance: Evidence from security analyst earnings forecast</i>	523 US firms in 1992	Multiple regression analysis	<u>Environmental responsibility:</u> Environmental proactivism measurement  <u>Financial performance:</u> one-year EPS and five-year EPS
2.	Sarkis and Cordeiro (2001) <i>An empirical evaluation of environmental efficiencies and firm performance: Pollution prevention versus end-of-pipe practice</i>	482 US firms in 1992	Multiple regression analysis	<u>Environmental responsibility:</u> Pollution prevention and end-of-pipe efficiencies  <u>Financial performance:</u> Return on sales
3.	Wagner et al. (2002) <i>The relationship between the environmental and economic performance of firms: An empirical analysis of the European paper industry</i>	Firms in Germany, Italy, the Netherlands, and United Kingdom in 1995-1997	Multiple regression analysis	<u>Environmental responsibility:</u> SO2 emissions, NO2 emissions, and CO2 emissions  <u>Financial performance:</u> ROCE, ROE, and ROS
4.	Rassier and Earnhart (2010) <i>Does the Porter hypothesis explain expected future financial performance? The</i>	Chemical manufacturing companies 1995-2000	Multiple regression analysis	<u>Environmental responsibility:</u> Clean water regulation  <u>Financial performance:</u>

	<i>effect of clean water regulation on chemical manufacturing firms</i>			Tobin's $q$
5.	Hart and Ahuja (1996) <i>Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance</i>	Standard and Poor's 500 list of corporation (1 year examination)	Multiple regression analysis	<u>Environmental responsibility:</u> Emissions reduction  <u>Financial performance:</u> ROS, ROA, ROE
6.	Russo and Fouts (1997) <i>A resource-based perspective on corporate environmental performance and profitability</i>	243 firms over two years	Multiple regression analysis	<u>Environmental responsibility:</u> Environmental ratings  <u>Financial performance:</u> ROA,
7.	Cortez and Cudia (2010) <i>Environmental innovations and financial performance of Japanese automotive and electronics companies</i>	Japanese automotive and electronics companies	Panel data regression and granger causality	<u>Environmental responsibility:</u> Environmental cost  <u>Financial performance:</u> Sales, income, assets, long-term debt, equity

Table 4. 2 Literature review of financial performance and environmental responsibility relationship

Source: developed for this research

Cordeiro and Sarkis (1997) conducted a research of corporate environmental proactivism and financial performance using security

analyst forecast. They found a negative relationship between toxic release inventory data and industry analyst 1-and 5-year earnings-per-share for a sample of 523 US firms in 1992. Moreover, their following research of the relationships between pollution prevention and end-of-pipe efficiencies with return on sales (ROS) also resulted in negative in all variables (Sarkis & Cordeiro, 2001).

Wagner et al. (2002) examined emission of chemical oxygen demand (COD), emission of sulphur dioxide (SO<sub>2</sub>), and emissions of nitrogenous oxides (NO<sub>2</sub>) as environmental performance and tried to establish relationships of those variables to economic performance, which are return on capital employed (ROCE), return on equity (ROE), and return on sales (ROS). They found that the result tended to the traditionalist view than the revisionist view.

Rassier and Earnhart (2010) investigated the effect of clean water regulation on expected future financial performance. Using tobin's  $q$  as a financial performance variable, their result supported the positive impacts of environmental regulation on financial performance.

Hart and Ahuja (1996) employed different independent variable for estimating financial performance. They utilized the emissions reduction as a measure of environmental performance. The most important in their research was their suggestion to explore the possibility of reverse causality

in future research. They believed that exploring the two directional relationships would portray a better investigation.

Russo and Fouts (1997) drew the resources-based view of the firm by linking positively between financial performance and environmental performance. Using ROA as the financial performance and industry growth as a moderating variables, they utilized an independent environmental rating as a proxy of environmental performance. The result showed that the relationship exists within industry growth existence. The most noteworthy in their research is their confirmation of resource-based view perspective as a basis of the relationship.

Cortez and Cudia (2012) explored the relationship by propose the virtuous cycle between environmental innovation and financial performance. They argue that the virtuous cycle exists in several companies, while the uni-directional relationship exists in all of the relationship.

However, no studies have been done in assessing environmental cost, CO2 emissions, and waste generation altogether as environment responsibility proxies. Regarding to the analytical method, only Cortez (2012) has been using *granger causality* to determine the virtuous cycles between environmental responsibility and financial performance, while other researchers utilize multiple regression analysis. Therefore, this

research tries to follow his methodology by applying the causality for determining the virtuous cycle.

Basically, the literature of relationship between environmental performance and environmental responsibility can be divided into several groups. First group tries to attempts the relationship using statistical models and ended with various results. For instance, Spicer (1978) found a significant relationship between firms' pollution-control records and financial variables. Waddock and Graves (1997) suggested that a company would generate more profits by performing well environmental activities, as suggested by the resources-based view perspective. Moreover, Konar and Cohen (2001) found that a poor performer of environmental responsibility has significant negative effect to the values of intangible assets of public companies. Jacobs et al. (2010) used a regression analysis to determine the relationship of environmental performance and accounting-based measures of a firm's performance.

In Japan, Iwata and Okada (2011) examined the relationship of green-gas emissions and waste reduction on companies' performance as represents by ROE, ROA, ROI, ROIC, ROS, Tobin's  $q-1$ , and the natural logarithm of Tobin's  $q$ . Samples were divided into 'clean' and 'dirty' industries to capture a specific phenomenon of the relationship. Using multiple regression, they concluded that waste emission did not affect

financial performance in both clean and dirty industries. In the contrary, a decrease in greenhouse-gas emissions leads to higher financial performance in clean industry, while it did not affect financial performance in dirty industry. They assumed that regulations has caused the difference of the results because Japanese laws and regulations strictly control waste problems while the greenhouse-gas issue voluntarily depends on the type of the company (Iwata & Okada, 2011).

#### **4.3. Green Supply Chain Management**

Emmet and Sood (2010) argued that green supply chain in the automobile industry can increase profitability up to 6% from design for disassembly, procurement cost reduction, material recycling, cost for disposing unrecyclable waste reduction, and lower maintenance cost. Similar result also reflected in the chemical industry that gains up to 3% of profitability improvement when the company conducts a green supply chain management.

Related to the green supply chain management in the automotive industry, Cortez and Cudia (2012) mentioned that automotive and electronics companies require thousand global suppliers which comply with eco-friendly products, which considered as an establishment of green supply chain. He also argued that chemical companies are the upstream of those industries (Cortez, 2012).

As a practice of green supply chain management, environmental responsibility performed by the companies especially in CO<sub>2</sub> emissions and waste reduction show the green supply chain in the business. Roy and Whelan (1992) worked in CO<sub>2</sub> reduction and waste management on green supply chain management. Other research point out that profitability and cost reduction has become company motivation to conduct green supply chain (Srivastava and Srivastava, 2006).

#### **4.4. Impact of Regulation**

Iwata and Okada (2011) found different results between companies' waste reduction performance and CO<sub>2</sub> performance to financial performance. They believed that regulation has caused the differences. While regulation of waste has been released after the World War II, the CO<sub>2</sub> emissions just started in the late 90s. Therefore, longer and stricter of regulation has impacts on the environmental performance.

Another research by Kitano (2012) shows the positive impacts of regulation of environmental policy in the Japanese car market on the automotive companies benefits from the environmental policies. He mentioned that Honda and Toyota are the two companies mostly gain from the regulation. As Toyota is the biggest hybrid-car producer in the world, it is obvious that Toyota would gained more benefit than any other company did in 2005-2010. Therefore,



automotive companies gain more profit because they can sell more cars; and as a result, increase their profits.

## **CHAPTER 5**

### **RESEARCH DESIGN AND METHODOLOGY**

This study adopted a mixed method to examine financial performance and environmental responsibility relationship. Using three variables of environmental responsibility and eight financial performance variables, this research conducted in Japanese manufacturing companies. In this chapter, explanations of those variables used, data sampling, data collection, and descriptive statistic are described. As a summary, this research indebt deeply to the work of Cortez (2011, 2012) because this research mostly follows his framework. However, combining the environmental cost, CO<sub>2</sub> emissions, and waste disposal management is the most noteworthy approach in this research.

#### **5.1. Definition of Variables**

In order to determine whether environmental responsibility affects in financial performance and vice versa, this research uses more in accounting instead of market performance to measure the economic benefit. Although

several previous studies suggested that market value seems to be more appropriate than accounting-based indicators (Margolis and Walsh, 2003; Mackey et al., 2007), accounting measurement more accurate and trustworthy because of it is based on historical performance (Spero, 1979)..

In this chapter, considering the two shareholder value models, variables are describe for eight financial performance and three environmental responsibility variables. The needs of definition are as a basis of uniformity of each variable in all the observation and as a basis for explaining previous study approach in each variable.

#### **5.1.1. Financial performance**

This research proposed eight variables for financial performance measurement: sales, cost of sales, net income, earning-per-share, return on equity, return on assets, stock price, and total assets.

##### **a. Sales**

Using sales as a proxy of financial performance is motivated by the Shrivasta (1995) which mentioned in his research about revenue enhancement of companies engaged in environmental responsibility.

In this research, sales mean the total sales and revenue in a period.

##### **b. Cost of sales**

By the virtue of business rationale of sustainability, cost and risk reduction is one of the financial performance affected by the

environmental responsibility (Kurucz, et. al., 2008). This research utilized the cost of sales as a proxy for determining the possibility of cost of sales reduction caused by environmental responsibility.

c. Net income

Based on the Ministry of Environment of Japan (2005), environmental cost can be allocated as an expense of a period or capitalized as an investment. Therefore, to cover the effects of environmental performance in expense account, net income account is used as a variable of financial performance. This variable is used by Cortez (2011, 2012) as one of his financial performance variables.

d. Earnings per share

In order to capture both return and shares outstanding, EPS measurement is used to conduct the environmental responsibility and financial performance relationship (Cordeiro & Sarkis, 1997). This variable not only reflects the short-term profitability of a company, but also reflects shareholders' perspective of the company.

e. Return on Assets

The return on assets (ROA) is the most popular financial performance indicator in determining environmental responsibility and financial performance relationship. Calculated by dividing net income by total

assets, Hart and Ahuja (1996), Russo and Fouts (1997) utilized this measurement.

f. Return on Equity

Return on Equity (ROE) has been a popular measurement in determining financial performance. It not only reflects the short-term profitability but also shareholders perspective, as similar with EPS. Wagner et. al. (2002) utilized this variable to determine the relationship between environmental and economic performance.

g. Stock price

As a future expectation of a company, stock price represents a long-term financial performance perspective. The stock price used in this research is the highest price of stock price in a year period as similar with Cortez (2011, 2012).

h. Total assets

Total asset has been used as a control variable in environmental responsibility and financial performance relationship. The reason of this selection is because it reflects a size of the company observed. This is important because of size of the company does matter in environmental responsibility (Keizai Doyukai, 2010). Cortez (2011, 2012) used this variable as his financial performance variable to capture company's size.

### **5.1.2. Environmental responsibility**

This research explores the environmental responsibility in three dimensions: environmental cost, CO<sub>2</sub> emissions, and waste disposal.

#### **a. Environmental cost**

This research using terminology “environmental cost” for every cost related to the environment that fulfill the requirements of environmental conservation cost of Japanese environmental accounting guideline. The total environmental taken into account because of cost-related-environmental can be capitalize as an investment or expense in a period (Ministry of Environment, 2005). Therefore, using total environmental cost would cover all the investment and expense of cost-related-environmental.

#### **b. CO<sub>2</sub> emissions**

A CO<sub>2</sub> emission used in this research covers the companies’ attempt on reducing the greenhouse gas effects on the Earth. Reduction in CO<sub>2</sub> emission is a sign of improvement of environmental responsibility of the company. In Japan, CO<sub>2</sub> emission regulation have become a focus in environment only for some recent years (Iwata & Okada, 2010). Consequently, different results with waste disposal management might be found in the research.

#### **c. Waste disposal**

Waste management has been regulated in Japan for a longer time due to some environmental accident happened after the World War II (Iwata & Okada, 2010). Managing waste might become crucial issues in environmental responsibility. In order to capture significant issues of waste disposal, this research used the amount of waste dispose and recycled in the company. Therefore, in the contrary with the CO<sub>2</sub> emission, waste disposal should be increase because it is reflects the amount of waste recycled.

## **5.2. Data Sample**

Sampling is the process of selecting cases from the entire set of population (Singleton & Straits, 2005). The target population in this research is the Japanese automotive industry, automotive spare-parts industry, and chemical industry. Sampling methodology divided into several methods. One of the method is purposive sampling. Given (2008) stated that purposive sampling used because of criterion sampling, which mean that the research involves in searching of specific criterion. Consequently, regarding to the enormous number of companies related to this research, purposive sampling is the more suitable decision for several reasons.

1. The type of company, even in the same industry, is different.

For example, automotive industry consists of cars, trucks, and motorcycle producer. The sizes of those companies are different and the difference would create an outlier in the observation. Another plausible reason is the chemical companies consists of hundreds companies-related-chemical that not necessarily part of the automotive green supply chain management.

2. The conformity with environmental accounting standard.

This research highly depends on the uniformity of the environmental accounting practice. Even though the Ministry of Environment released the standard of environmental accounting, some of the companies prefer to comply with other standard, such as Global Reporting Initiatives. Consequently, choosing the sample should consider whether the companies' environmental report is similar with the Japanese standard or not.

3. Incomplete data sets

In order to perform granger causality, the data set should at least in 10 years time series. Considering the standards had just published in 2000, high possibility, the standard did not implemented in the early years. Therefore, purposive sampling is needed to choose which company has a full set of data for 10 years (2003-2012) related to environmental cost, CO<sub>2</sub> emissions, and waste disposal.

Therefore, three industries as a reflection of green supply chain of automotive industries analyzed by choosing samples purposively to cover the

size, types, and uniformity of the report in each industry taken from their association.

1. Automotive industry

In Japan, Japan Automobile Manufacturers Association, Inc. (JAMA) is the industry association of passenger cars, trucks, buses, and motorcycles manufacturers (JAMA, 2013). Members of JAMA are Daihatsu, Fuji Heavy Industries, Hino, Honda, Isuzu, Kawasaki, Mazda, Mitsubishi, Mitsubishi Trucks, Nissan, Suzuki, Toyota, Trucks corporation, and Yamaha. This research only search the passenger cars considering the comparability of the company's size. Therefore, Daihatsu, Fuji Heavy Industries, Honda, Isuzu, Mazda, Mitsubishi, Nissan, Suzuki, Toyota should be chosen. However, Nissan's environmental report does not thoroughly comply with the environmental accounting standard. Consequently, Nissan should be taken out from the observations; then only eight companies will observed in this research.

2. Spare part industry

The automotive spare-parts companies in Japan are associate under JAPIA (Japan Auto Parts Industries Association). Total member of JAPIA in 2013 is 494 companies ranging from more than thousands different



automotive spare-parts products. However, most of the companies does not fulfill three requirements as mentioned above. As a results, this research only able to investigate 10 companies: Mitsubishi Cable, NGK, NTN, Daikin, Denso, Yazaki, Stanley, Ube, Sumitomo wiring, and Sawafuji Corporation.

### 3. Chemical industry

Choosing a sample from chemical companies is the most difficult compare to other two industries. As chemical industry consists of numerous types of companies, the selection should be more cautiously.

The Japanese Chemical Industry Association (JCIA) consists of 175 companies. In view of this research tries to establish a green supply chain management in automotive industry, sample for chemical companies have to be related or partly related to the automotive industry. As a result, Asahi Kasei, Central Glass, Hitachi Chemical, Kuraray, Mitsubishi Chemical, Nippon Kayaku, Tosoh, Nippon Paint, Mitsui Chemical, and Kansai Paint are selected for the observation.

## **5.3.Data Collection**

Collected data consists of two types of data, the financial performance data and the environmental responsibility data. The latter data ware gathered from the companies' environmental report/Corporate Social Responsibility report/Social

report. Data consists of 28 observed companies (eight automotive companies, 10 automotive spare-parts companies, and 10 chemical companies) that selected by purposive sampling. Each company provides 10 years data from 2003-2012 as environmental studies need a longer period (Cortez, 2012).

Data of financial performance were gathered from Research Insight COMPUSTAT of the 28 observed companies. The data consists of sales, cost of sales, net income, EPS, ROA, ROE, stock price, and total assets. In order to ensure the truthfulness of the data from COMPUSTAT, sampling test were performed through the published financial report of the companies.

#### **5.4. Methodology**

The methodology of this research mostly following the works of Cortez (2011, 2012) by conducts panel data regression to determine the direction relationships. Therefore, environmental cost, waste generated, and CO<sub>2</sub> emissions as controlling variable over financial performance (sales, cost of sales, gross profit, net income, return on asset, return on equity, earning per share, stock price, and total assets). The relationships then reversed to determine the bi-directional relationship.

Furthermore, granger causality tests performed to determine the direction of each variable and to determine whether virtuous cycles exist. Finally, using multivariate panel regression, this research tries to establish the impact of the

automotive industry on automotive spare-parts industry and chemical industry, and automotive industry and automotive spare-parts industry on the chemical industry.

## 5.5. Hypotheses

Research-based view perspective suggests that environmental cost, waste, and CO<sub>2</sub> emissions have positive impacts on financial performance. The latter was captured in several dimensions: sales, cost of sales (which supposed to have a negative coefficient) and net income are a proxy to capture profitability, ROA, ROE, and EPS are the basis for stakeholder and shareholders intention, stock price as a future expectation of company performance, and total assets as a representative of firm size.

Therefore, the hypotheses of this relationship in all the three industries are as the following.

*H1a : Environmental responsibility positive impact financial performance of automotive companies*

*H1b: Environmental responsibility positive impact financial performance of spare parts companies*

*H1c: Environmental responsibility positive impact financial performance of chemicals companies*

On the other hand, previous researcher suggests the slack availability of resources as an illustration of the reverse relationship. Here, the financial performance has positive impacts on the environmental responsibility. The argument based on the deem of companies have to be profitable and have enough financial resources before engaging in environmental responsibility. Thus, the variables should be reversed to capture this relationship; environmental responsibility becomes the controllable variable and financial performance as independent variable. Therefore, the hypotheses in the three industries are as follows:

*H2a: Financial performance positive impact environmental responsibility of automotive companies*

*H2b: Financial performance positive impact environmental responsibility of spare parts companies*

*H2c: Financial performance positive impact environmental responsibility of chemicals companies*

Those hypotheses can be expanded in each variable corresponding to other variable. The environmental responsibility consists of three measurements: environmental cost, CO<sub>2</sub> emissions, and waste disposal; therefore, the number of relationship in this observation would positively higher than the number of hypothesis. Consequently, more explanation of the results undeniably needed.

The next relationship proposed by Orlitzky (2009) when he mentioned the virtuous cycle between financial performance and environmental responsibility. Moreover, Cortez (2011) conducted granger causality for depict the virtuous cycle and labeled it as an accumulated slack theory as a concurrent bi-directional relationship. Therefore, this research following the previous studies by proposing the existence of virtuous cycle between the variables in the three observed industries.

*H3a: Virtuous cycle exists between environmental responsibility and financial performance of automotive companies*

*H3b: Virtuous cycle exists between environmental responsibility and financial performance of spare parts companies*

*H3c: Virtuous cycle exists between environmental responsibility and financial performance of chemicals companies*

Lastly, the three industries observed above are practically integrated in green supply chain management. Automotive spare-parts industry is the first-tier supplier of the automotive industry and chemical industry is the upstream business of the other two industries. Therefore, by the virtue of network theory, the companies performs environmental responsibility because of the impact of the automotive industry.

*H4a: Automotive industry performance positive impact financial performance of spare part and chemical industry*

*H4b: Automotive industry performance and spare part industry positive impact financial performance of chemical industry*

## **5.6. Correlation and Regression Assumptions**

Using a panel data regression in a multivariate distribution, more variables are involved in the observations. In the condition of bivariate regression only need one independent variable and one dependent variable (Miles & Shelvin, 2001), multivariate regressions should consider other variables in the observation. Therefore, some statistical test should performed as the basic assumptions of the data. The normality, as a proxy to explain that data are distributed normal. Homoscedasticity, as an assumption for the variance in independent variables are equal. Third, it is expected that the variables are independent each other and no correlation between them. Lastly, testing the existence of multicollinearity, as an assumption of no intersect variable performed.

### **5.6.1. Correlation**

Performing a correlation test provides a relationship between two variables. Correlation only used to determine the strength of relationship between two variables (Pallant, 2005). The most common statistical test used to determine correlation is Pearson correlation, which utilized also in this research.

Cohen (1988) suggested a criteria to determine the correlation strength as follows:

The Pearson Correlation	Relationship
0.10 – 0.29	Small
0.30 – 0.49	Medium
0.50 – 1.00	High

This research used STATA software for testing the correlation as the preliminary approach , the results felt ranging into -0.39 to 0.569 which means that some of the variables are negative corresponding and positive corresponding. However, the range still in the range of Pearson Correlation Distribution.

#### **5.6.2. Normal distribution**

The first assumption test is normal distribution test, which can be examines by the normality of data distributions. If the distribution differs from normality, the assumptions become non-normal distribution (Miles & Shelvin, 2001).

Using STATA software, the results show the normal distribution of variables used in this research.

### **5.6.3. Homoscedasticity**

This test is useful to determine similar variance among variables exists or not. The opposite of homoscedasticity is heteroscedasticity, which lessen the result of the regression coefficient. Tabachnik & Fidell (2001) believed that if standard residual values are above 3.3 or less than -3.3, the heteroscedasticity exists.

This research use STATA for conducting whether heteroscedasticity exists or not. The result shows a number of 0.000, which means that no heteroscedasticity exists.

### **5.6.4. Autocorrelation**

Autocorrelation takes place when a variable is considered as dependent because always associates with itself. Two situations of autocorrelation exist. First, multiple measures of the same entity accessed in a time-series statistic. Second, a non-independence data exists because of grouping area (Miles & Shelvin, 2001). Avoiding the autocorrelation can be done by simply omitting one variable from the panel data (Tabchnick & Fidell, 2001).

By carefully choose the variables, autocorrelation can be avoided. Statistically, the results show 0 for the autocorrelation test, which means that no autocorrelation.



#### **5.6.5. Multicollinearity**

Multicollinearity is a redundancy of variables in a set of data. This happens because of a closed-relationship between the variables used in the same data panel (Tabachnick & Fidell, 2001).

Choosing the variables is the most beneficial to avoid the multicollinearity. In the preliminary research, one variable should be dropped because of multicollinearity exists is the gross profit variable. When the result shows positive multicollinearity with sales and cost of sales, once the gross profit removed, the result showed a non-multicollinearity.

## **CHAPTER 6**

### **DATA ANALYSIS AND RESULTS**

Previous research has shown the evolution of a relationship between financial performance and environmental responsibility. In this research, the relationship explored in Japanese automotive industries, automotive spare-part industries, and chemical industries using panel data regression.

#### **6.1. Panel data regression in automotive industry**

Automotive companies are one of the pioneers of environmental responsibility practice in Japan. Therefore, data gathered for all companies are complete and well balanced.

##### **6.1.1. Environmental responsibility impacts on financial performance**

Taking environmental responsibility as independent variables and financial performance as dependent variable, panel data regression then performed to indicate the impacts of environmental responsibility to financial performance.

As shown in table 6.1, the p-values of are less than 0.05 for all environmental costs variables. This means that environmental costs positively affect to all of the financial performance variables. This result conform with Cortez (2011) conclusion in his research, that environmental costs has a significant impacts to financial performances.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.000	0.01405	0.092	0.0045	0.043	0.0185
Cost of Sales	0.000	0.01645	0.049	0.0128	0.143	0.0739
Net Income	0.039	0.02678	0.170	0.0065	0.028	0.1202
EPS	0.004	0.02540	0.058	0.0012	0.017	0.0023
ROA	0.028	0.02129	0.152	0.0012	0.093	0.0210
ROE	0.041	0.02241	0.210	0.0328	0.087	0.1027
Share Price	0.000	0.01976	0.043	0.0890	0.276	0.0037
Total Assets	0.000	0.01142	0.042	0.0652	0.036	0.0290

Table 6. 16 Financial performance impact to environmental responsibility  
in Japanese automotive companies

Source: Processed primary data, 2013

Regarding to the CO<sub>2</sub> emissions, the result shows that only cost of sales, stock price, and total assets affected by companies' CO<sub>2</sub> management. Increase in cost of sales can be assumed as an additional cost should be occurred in managing green gas emissions. However, positive results in stock price and total assets reflect the long-term companies' performance and size of the company. This results in line with Iwata and Okada (2011) when argued that greenhouse gas reduction increases most long-run financial performance and does not have a significant effect on short-run financial performance.

However, another different result of environmental responsibility and financial performance relationships occurred in waste disposal management as a proxy for environmental responsibility. In table 6.1 waste disposal management positively impacts to the revenues, net

income, EPS, and total assets. As a waste can be recycling and can be sold, it is increase the revenues of the companies, increase their profitability and EPS as mentioned in the environmental reports. Moreover, the result also explains the reason of Japanese companies' behavior in engaging themselves in the environmental actions.

### 6.1.2. Financial performance impacts to environmental responsibility

The previous relationship employs the environmental responsibility as independent variables and financial performance as dependent variables. In order to measure whether environmental responsibility affected by financial performance, the previous relationships ought to be reverse. Therefore, financial performances are the independent variables and environmental responsibility becomes dependent variables. Using similar methodology, panel data regression performed to indicate the impacts of financial performance to environmental responsibility.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.002	0.01131	0.092	0.02374	0.003	0.01389
Cost of Sales	0.000	0.03387	0.020	0.01348	0.133	0.10789
Net Income	0.042	0.02973	0.933	0/13141	0.047	0.19383
EPS	0.030	0.03838	0.082	0.08234	0.022	0.01249
ROA	0.033	0.00825	0.753	0.02394	0.102	0.01132
ROE	0.023	0.03839	0.862	0.01471	0.091	0.01313
Share Price	0.004	0.02930	0.203	0.19244	0.142	0.00314
Total Assets	0.029	0.00349	0.053	0.13498	0.093	0.09429

**Table 6. 17** Financial performance impact to environmental responsibility in Japanese automotive companies

Source: Processed primary data, 2013

Table 6.2 shows the results when financial performance explains environmental responsibility variables. All the financial performances positively affect to environmental cost variable as shown in the p-values are less than 0.05. The result is a similar result with Cortez (2011) that mentioned the environmental costs significantly affected by financial performances.

The relationship of financial performance to the CO<sub>2</sub> emissions in table 6.2 shows that only cost of sales impacts to the companies' greenhouse gas performance. The positive result in cost of sales is highly expected because companies usually classify the environmental cost into additional cost of sales and capital investment. Using this statistical result, it shows that automotive companies classified their CO<sub>2</sub> management cost more into the cost of sales.

Interestingly, the result of financial performance affects to waste management statistically shows an almost similar result with the one when the relationship has not reversed. Revenues, net income, and earning-per-share positively influence companies' waste management. The companies invest for managing their waste disposal using short-term financial performance.

## 6.2. Panel data regression in automotive spare-part industry

Automotive spare-part industry has a close relationship with the automotive industry. Spare-part companies supply automotive parts and become the first tier in supply chain management. Exploring this companies' type provide a bigger picture of automotive green supply chain management.

### 6.2.1. Environmental responsibility impacts to financial performance

Similar methodology with in automotive industry in the previous section, environmental responsibility is the independent variables and financial performance as dependent variable. Then panel data regression performed to indicate the impacts of environmental responsibility to financial performance.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.023	0.03203	0.094	0.03963	0.193	0.03203
Cost of Sales	0.042	0.06863	0.082	0.02439	0.048	0.12398
Net Income	0.059	0.08758	0.103	0.02308	0.103	0.04274
EPS	0.040	0.19823	0.203	0.00239	0.089	0.23054
ROA	0.103	0.02373	0.194	0.01390	0.094	0.01349
ROE	0.092	0.07931	0.130	0.09673	0.183	0.00323
Share Price	0.023	0.00970	0.082	0.09324	0.293	0.10393
Total Assets	0.042	0.06269	0.130	0.07699	0.007	0.02402

Table 6. 18 Environmental responsibility impacts to financial performance in Japanese automotive spare-part industry

Source: Processed primary data, 2013

As shown in table 6.3, the significant result only occur in the relationship of environmental cost to revenues, cost of sales, EPS, stock price, and

total assets, and waste disposal to cost of sales and total assets. Statistically, environmental cost positively influences companies' short-term financial performance as indicated by positive results in revenue, cost of sales and EPS. Waste disposal management positively influences the companies' cost of sales and total assets, which almost similar with the automotive industry's result. On the other hand, no significant results of CO<sub>2</sub> emissions influence to financial performance in automotive spare-part industry, as designated by no p-values less than 0.05.

#### 6.2.2. Financial performance impacts to environmental responsibility

This section reverses the dependent and independent variables from the previous section. Therefore, financial performance becomes independent variables while environmental responsibility is the dependent variables. Panel data regression performed to indicate the impacts of financial performance to environmental responsibility.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.012	0.00875	0.163	0.10970	0.048	0.00243
Cost of Sales	0.027	0.03995	0.247	0.04524	0.021	0.03230
Net Income	0.006	0.19863	0.097	0.03456	0.258	0.00834
EPS	0.139	0.18080	0.108	0.00245	0.596	0.07929
ROA	0.190	0.00123	0.339	0.20078	0.208	0.10245
ROE	0.202	0.00700	0.503	0.19887	0.454	0.36764
Share Price	0.040	0.07120	0.238	0.00120	0.097	0.03533
Total Assets	0.037	0.10903	0.064	0.02912	0.025	0.04860

Table 6. 19 Financial performance impacts to environmental responsibility  
in Japanese automotive spare-part industry

Source: Processed primary data, 2013

Based on table 6.4, five variables of financial performance correspond positively with environmental cost. There are revenues, cost of sales, net income, stock price, and total assets. Comparing this result to the reversed variables results, financial performance positively influences the environmental cost except for EPS. Moreover, waste management also affected by short-term profitability of the companies, which indicated by low p-values in revenues and cost of sales. Furthermore, total assets as a proxy of companies' size also affects environmental responsibility. However, similar with the previous result of financial performance and environmental responsibility, CO<sub>2</sub> emissions has no significantly affected by financial performance.

### **6.3. Panel data regression in chemical industry**

Chemical companies provide raw materials for automotive and automotive spare-parts companies. Exploring this companies' type provide a bigger picture of automotive green supply chain management.

#### **6.3.1. Environmental responsibility impacts to financial performance**

The result of panel data regression of Japanese chemical industry is summarized in table 6.5.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.007	0.03435	0.092	0.13435	0.083	0.54735
Cost of Sales	0.034	0.04731	0.103	0.04231	0.023	0.03531
Net Income	0.082	0.04778	0.324	0.04533	0.042	0.20433



EPS	0.021	0.13540	0.238	0.23420	0.019	0.19420
ROA	0.084	0.10129	0.202	0.24549	0.194	0.24303
ROE	0.069	0.08244	0.430	0.25934	0.083	0.29492
Share Price	0.023	0.02133	0.150	0.02459	0.133	0.02932
Total Assets	0.001	0.01136	0.293	0.04303	0.021	0.22838

Table 6. 20 Environmental responsibility impacts to financial performance  
in Japanese chemical industry

Source: Processed primary data, 2013

The result shows environmental cost influences chemical companies revenues, cost of sales, EPS, stock price, and total assets as the p-values of those variables are less than 0.05. Short-term profitability as represented by revenues, cost of sales, and EPS, the firm size, and future expectation of the company are influenced by companies' environmental cost. The next variable, CO<sub>2</sub> emissions, has no significant impacts to all financial performance variables. Lastly, waste disposal management has positive influence to cost of sales, net income, EPS, and total assets. This result shows that waste management able to give significant contribution to companies' short-term profitability and company size.

### **6.3.2. Financial performance impacts to environmental responsibility**

The variables then reversed in order to examines financial performance influences to environmental responsibility. Therefore, financial performance becomes independent variables and environmental responsibility are the dependent variable.

	Environmental cost		CO <sub>2</sub> emissions		Waste generation	
	P> t	Coefficient	P> t	Coefficient	P> t	Coefficient
Revenue	0.007	0.13932	0.121	0.43932	0.001	0.23522
Cost of Sales	0.020	0.01893	0.135	0.05493	0.023	0.02343
Net Income	0.013	0.02833	0.053	0.04343	0.083	0.45933
EPS	0.104	0.02524	0.074	0.03453	0.078	0.03322
ROA	0.081	0.04403	0.219	0.13305	0.194	0.32499
ROE	0.093	0.09441	0.240	0.06409	0.120	0.02203
Share Price	0.023	0.01345	0.303	0.11463	0.229	0.00394
Total Assets	0.009	0.01542	0.193	0.24939	0.025	0.30843

Table 6. 21 Environmental responsibility impacts to financial performance  
in Japanese chemical industry

Source: Processed primary data, 2013

Table 6.6 points up the result of financial performance impacts to environmental responsibility. Interestingly the results are similar with the automotive spare-part industry results. Revenues, cost of sales, and total assets are positively impact to the environmental cost and waste disposal management. Moreover, net income and stock price have a significant impact to the environmental cost only. Other three financial performance: EPS, ROA, and ROE respond insignificant to the every variables of environmental responsibility.

#### 6.4. Virtuous cycle

Using panel data regression to elaborate the relationship between financial performance and environmental responsibility provide a direct relationship

among them. Cortez (2012) argued the possibility of the variables in the virtuous cycle relationship. Therefore, granger causality performed to investigate the virtuous cycle between financial performance and environmental responsibility in Japanese automotive industry, Japanese automotive spare-part industry, and Japanese chemical industry.

#### **6.4.1 Automotive companies**

The result of granger causality test of eight Japanese automotive companies' financial performance and environmental responsibility are summarized in table 6.7.

Table 6.7 shows the result of granger causality test of eight Japanese automotive companies. The first column shows the explanation of the relationship, direction column illustrates the percentage of companies in related to the relationship given in the first column. Then, the last column explains the virtuous cycle between variables.

Following Cortez (2011) works about virtuous cycles, if more than 50% of the observations are virtuous cycle, this means that the virtuous cycle exists. Therefore, in Japanese automotive companies, virtuous cycles exist in revenue and environmental cost, cost of sales and environmental cost, and lastly, EPS and environmental cost.

1. Financial performance and environmental cost

	Direction	Virtuous cycle
Revenue impacts to environmental cost Environmental cost impacts revenue	62.50% 62.50%	62.50%
Cost of sales impacts to environmental cost Environmental cost impacts to cost of sales	50.00% 50.00%	50.00%
Net income impacts to environmental cost Environmental cost impacts to net income	75.00% 62.50%	37.50%
ROA impacts to environmental cost Environmental cost impacts to ROA	75.00% 50.00%	37.50%
ROE impacts to environmental cost Environmental cost impacts to ROE	75.00% 62.50%	37.50%
EPS impacts to environmental cost Environmental cost impacts to EPS	75.00% 75.00%	62.50%
Stock price impacts to environmental cost Environmental cost impacts to stock price	50.00% 62.50%	37.50%
Total asset impacts to environmental cost Environmental cost impacts to total asset	62.50% 75.00%	37.50%

Table 6. 22 Granger causality between financial performance and environmental cost of Japanese automotive companies  
Source: Processed primary data, 2013

## 2. Financial performance and CO<sub>2</sub> emissions

	Direction	Virtuous cycle
Revenue impacts to CO <sub>2</sub> emissions	62.50%	50.00%
CO <sub>2</sub> emissions impacts revenue	75.00%	
Cost of sales impacts to CO <sub>2</sub> emissions	50.00%	25.00%
CO <sub>2</sub> emissions impacts to cost of sales	50.00%	
Net income impacts to CO <sub>2</sub> emissions	75.00%	50.00%
CO <sub>2</sub> emissions impacts to net income	62.50%	
ROA impacts to CO <sub>2</sub> emissions	75.00%	50.00%
CO <sub>2</sub> emissions impacts to ROA	62.50%	
ROE impacts to CO <sub>2</sub> emissions	75.00%	75.00%
CO <sub>2</sub> emissions impacts to ROE	87.50%	
EPS impacts to CO <sub>2</sub> emissions	37.50%	12.50%
CO <sub>2</sub> emissions impacts to EPS	50.00%	
Stock price impacts to CO <sub>2</sub> emissions	62.50%	37.50%
CO <sub>2</sub> emissions impacts to stock price	62.50%	
Total asset impacts to CO <sub>2</sub> emissions	50.00%	50.00%
CO <sub>2</sub> emissions impacts to total asset	75.00%	

Table 6. 23 Granger causality between financial performance and CO<sub>2</sub> emissions of Japanese automotive companies

Source: Processed primary data, 2013

Based on table 6.8, virtuous cycles exist in revenue and CO<sub>2</sub> emissions, net income and CO<sub>2</sub> emissions, ROA and CO<sub>2</sub> emissions, ROE and CO<sub>2</sub> emissions, and between total assets and CO<sub>2</sub> emissions.

### 3. Financial performance and waste disposal

	Direction	Virtuous cycle
Revenue impacts to waste disposal Waste disposal impacts revenue	37.50% 25.00%	12.50%
Cost of sales impacts to waste disposal Waste disposal impacts to cost of sales	50.00% 13.00%	12.50%
Net income impacts to waste disposal Waste disposal impacts to net income	75.00% 37.50%	25.00%
ROA impacts to waste disposal Waste disposal impacts to ROA	75.00% 25.00%	25.00%
ROE impacts to waste disposal Waste disposal impacts to ROE	50.00% 50.00%	25.00%
EPS impacts to waste disposal Waste disposal impacts to EPS	25.00% 25.00%	25.00%
Stock price impacts to waste disposal Waste disposal impacts to stock price	62.50% 25.00%	12.50%
Total asset impacts to waste disposal Waste disposal impacts to total asset	50.00% 25.00%	25.00%

Table 6. 24 Granger causality between financial performance and waste disposal of Japanese automotive companies

Source: Processed primary data, 2013

Table 6.9 shows that no virtuous cycles exist between financial performance and waste disposal of Japanese automotive companies.

#### 6.4.2 Automotive spare-part companies

##### 1. Financial performance and environmental cost

	Direction	Virtuous cycle
Revenue impacts to environmental cost Environmental cost impacts revenue	20.00% 30.00%	0.00%
Cost of sales impacts to environmental cost Environmental cost impacts to cost of sales	30.00% 10.00%	0.00%
Net income impacts to environmental cost Environmental cost impacts to net income	40.00% 10.00%	0.00%
ROA impacts to environmental cost Environmental cost impacts to ROA	30.00% 20.00%	10.00%
ROE impacts to environmental cost Environmental cost impacts to ROE	0.00% 20.00%	0.00%
EPS impacts to environmental cost Environmental cost impacts to EPS	40.00% 10.00%	0.00%
Stock price impacts to environmental cost Environmental cost impacts to stock price	30.00% 20.00%	0.00%
Total asset impacts to environmental cost Environmental cost impacts to total asset	10.00% 10.00%	0.00%

Table 6. 25 Granger causality between financial performance and environmental cost of Japanese automotive spare-parts companies

Source: Processed primary data, 2013

Based on table 6.10, there is no virtuous cycles between financial performance and environmental cost in Japanese automotive spare-part companies.

## 2. Financial performance and CO<sub>2</sub> emissions

	Direction	Virtuous cycle
Revenue impacts to CO <sub>2</sub> emissions	50.00%	20.00%
CO <sub>2</sub> emissions impacts revenue	40.00%	
Cost of sales impacts to CO <sub>2</sub> emissions	60.00%	40.00%
CO <sub>2</sub> emissions impacts to cost of sales	50.00%	
Net income impacts to CO <sub>2</sub> emissions	30.00%	10.00%
CO <sub>2</sub> emissions impacts to net income	30.00%	
ROA impacts to CO <sub>2</sub> emissions	30.00%	10.00%
CO <sub>2</sub> emissions impacts to ROA	10.00%	
ROE impacts to CO <sub>2</sub> emissions	30.00%	10.00%
CO <sub>2</sub> emissions impacts to ROE	20.00%	
EPS impacts to CO <sub>2</sub> emissions	20.00%	10.00%
CO <sub>2</sub> emissions impacts to EPS	10.00%	
Stock price impacts to CO <sub>2</sub> emissions	30.00%	10.00%
CO <sub>2</sub> emissions impacts to stock price	20.00%	



Total asset impacts to CO <sub>2</sub> emissions	40.00%	10.00%
CO <sub>2</sub> emissions impacts to total asset	40.00%	

Table 6. 26 Granger causality between financial performance and CO<sub>2</sub> emissions of Japanese automotive spare-parts companies

Source: Processed primary data, 2013

The relationship between financial performance and CO<sub>2</sub> emissions in Japanese automotive spare-part companies mostly one-way direction or bi-directional. However, there is no evidence of virtuous cycles in this relationship based on table 6.11.

### 3. Financial performance and waste disposal

	Direction	Virtuous cycle
Revenue impacts to waste disposal	30.00%	20.00%
Waste disposal impacts revenue	40.00%	
Cost of sales impacts to waste disposal	40.00%	30.00%
Waste disposal impacts to cost of sales	40.00%	
Net income impacts to waste disposal	20.00%	10.00%
Waste disposal impacts to net income	20.00%	
ROA impacts to waste disposal	20.00%	0.00%
Waste disposal impacts to ROA	20.00%	
ROE impacts to waste disposal	30.00%	0.00%
Waste disposal impacts to ROE	20.00%	
EPS impacts to waste disposal	20.00%	0.00%
Waste disposal impacts to EPS	20.00%	

Stock price impacts to waste disposal	40.00%	0.00%
Waste disposal impacts to stock price	10.00%	
Total asset impacts to waste disposal	30.00%	0.00%
Waste disposal impacts to total asset	10.00%	

Table 6. 27 Granger causality between financial performance and waste disposal of Japanese automotive spare-parts companies

Source: Processed primary data, 2013

The result of financial performance and waste disposal relationship in Japanese automotive spare-part companies as shown in table 6.12 shows no virtuous cycles exist between the variables.

### 6.4.3 Chemical companies

#### 1. Financial performance and environmental cost

	Direction	Virtuous cycle
Revenue impacts to environmental cost	60.00%	40.00%
Environmental cost impacts revenue	50.00%	
Cost of sales impacts to environmental cost	60.00%	40.00%
Environmental cost impacts to cost of sales	60.00%	
Net income impacts to environmental cost	40.00%	30.00%
Environmental cost impacts to net income	20.00%	
ROA impacts to environmental cost	40.00%	10.00%
Environmental cost impacts to ROA	20.00%	
ROE impacts to environmental cost	20.00%	30.00%
Environmental cost impacts to ROE	40.00%	

EPS impacts to environmental cost	30.00%	30.00%
Environmental cost impacts to EPS	40.00%	
Stock price impacts to environmental cost	10.00%	20.00%
Environmental cost impacts to stock price	20.00%	
Total asset impacts to environmental cost	60.00%	40.00%
Environmental cost impacts to total asset	60.00%	

Table 6. 28 Granger causality between financial performance and environmental cost of Japanese chemical companies

Source: Processed primary data, 2013

The results of granger causality of financial performance and environmental responsibility of Japanese chemical companies are shown in table 6.13. Some of the variables are bi-direction but no evidence to support virtuous cycles.

## 2. Financial performance and CO<sub>2</sub> emissions

	Direction	Virtuous cycle
Revenue impacts to CO <sub>2</sub> emissions	60.00%	20.00%
CO <sub>2</sub> emissions impacts revenue	40.00%	
Cost of sales impacts to CO <sub>2</sub> emissions	20.00%	10.00%
CO <sub>2</sub> emissions impacts to cost of sales	30.00%	
Net income impacts to CO <sub>2</sub> emissions	40.00%	30.00%
CO <sub>2</sub> emissions impacts to net income	20.00%	
ROA impacts to CO <sub>2</sub> emissions	40.00%	20.00%

CO <sub>2</sub> emissions impacts to ROA	30.00%	
ROE impacts to CO <sub>2</sub> emissions	30.00%	10.00%
CO <sub>2</sub> emissions impacts to ROE	30.00%	
EPS impacts to CO <sub>2</sub> emissions	20.00%	10.00%
CO <sub>2</sub> emissions impacts to EPS	40.00%	
Stock price impacts to CO <sub>2</sub> emissions	60.00%	40.00%
CO <sub>2</sub> emissions impacts to stock price	40.00%	
Total asset impacts to CO <sub>2</sub> emissions	30.00%	0.00%
CO <sub>2</sub> emissions impacts to total asset	10.00%	

Table 6. 29 Granger causality between financial performance and CO<sub>2</sub> emissions of Japanese chemical companies

Source: Processed primary data, 2013

Table 6.14 shows the granger causality test results of financial performance and CO<sub>2</sub> emissions in Japanese chemical companies. Statistically, no supporting evidence for virtuous cycles relationship between the two variables.

### 3. Financial performance and waste disposal

	Direction	Virtuous cycle
Revenue impacts to waste disposal	50.00%	20.00%
Waste disposal impacts revenue	20.00%	
Cost of sales impacts to waste disposal	40.00%	30.00%
Waste disposal impacts to cost of sales	20.00%	

Net income impacts to waste disposal	40.00%	10.00%
Waste disposal impacts to net income	20.00%	
ROA impacts to waste disposal	20.00%	30.00%
Waste disposal impacts to ROA	40.00%	
ROE impacts to waste disposal	30.00%	30.00%
Waste disposal impacts to ROE	40.00%	
EPS impacts to waste disposal	10.00%	20.00%
Waste disposal impacts to EPS	20.00%	
Stock price impacts to waste disposal	20.00%	10.00%
Waste disposal impacts to stock price	10.00%	
Total asset impacts to waste disposal	20.00%	0.00%
Waste disposal impacts to total asset	10.00%	

Table 6. 30 Granger causality between financial performance and waste disposal of Japanese chemical companies

Source: Processed primary data, 2013

Granger causality test were performed to explore the possibility of financial performance and waste disposal in Japanese chemical companies. The results are shown in table 6.15 with a conclusion that no significant data to support virtuous cycles in these relationship.

### **6.5. Impact of automotive industry on automotive spare part company**

The previous section tried to examine whether virtuous cycles exist or not in the relationship between financial performance and environmental responsibility. However, based on the green supply chain management, automotive industry is closely related to spare part industry. Cortez (2012) explored this similar relationship between automotive industry and electronics industry by multivariate panel regression. Therefore, following his work, taking automotive industry sales as an independent variable and automotive spare part industry sales as a dependent variable, multivariate panel regression are performed.

The result of the regression shows a low p-value of 0.0000303, which is a signal of a positively significant relationship.

### **6.6. Impact of automotive and automotive spare-part industry on chemical industry**

As mentioned in previous chapter, Japanese chemical industry supplies raw materials to automotive industry and automotive spare-part industry. This creates a green supply chain in Japanese manufacturing industry. Testing the impacts of automotive and automotive spare-part industry on chemical industry utilize the revenue of automotive and automotive spare-part industry as controlling variables and revenues of chemical industry as dependent variables. The results show significant impact by p-value of 0.0000505 and 0.0000401.

## **CHAPTER 7**

### **DISCUSSIONS OF FINDINGS AND IMPLICATION**

The main objective of this study was to examine the relationship between financial performance and environmental responsibility in Japanese manufacturing industry. The framework used to guide this inquiry was to answer the following research questions: (1) what is the relationship between environmental responsibility and financial performance in Japanese automotive, automotive spare-part, and chemical industry. This questions divided into three sub-questions based on the variables and methodology applied in conducting the research. (a) environmental responsibility impacts on financial performance, (b) financial performance impacts on environmental responsibility, and (c) virtuous cycles between financial performance and environmental responsibility. (2) what is the relationship among Japanese automotive industry, automotive spare-part industry, and chemical industry. This chapter will examine the results from the previous chapter to answer those questions.

#### **7.1. Environmental responsibility impacts on financial performance**

This question was based on resources-based-view perspective, which becomes a basis of the business rationale of sustainability. This perspective justifies company's behavior in doing green business, stakeholders' orientation, and finally achieve better financial performance.

Based on the results in the previous chapter, three variables of environmental responsibility: environmental cost, CO<sub>2</sub> emissions, and waste disposal management, examine together with eight financial performances: revenues, cost of sales, net income, EPS, ROA, ROE, stock price, and total assets in Japanese automotive industry, automotive spare-part industry, and chemical industry. The summary of the results are explained in the following.

	Automotive			Spare-part			Chemical		
	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste
Revenues	O	X	O	O	X	X	O	X	X
Cost of sales	O	O	X	O	X	O	O	X	O
Net income	O	X	O	X	X	X	X	X	O
EPS	O	X	O	O	X	X	O	X	O
ROE	O	X	X	X	X	X	X	X	X
ROA	O	X	X	X	X	X	X	X	X
Stock price	O	O	X	O	X	X	O	X	X
Total assets	O	O	O	O	X	O	O	X	O

Table 7. 5 Results summary of environmental responsibility impacts on financial performance

Source: Processed primary data, 2013

### 7.1.1. Automotive companies

Automotive companies have more significant result in terms of financial performance and environmental responsibility compare to automotive spare-part companies and chemical companies.. As shown in table 7.1, statistically, all the financial performance: revenues, cost of sales, net income, EPS, ROE, ROA, stock price and total assets are significantly affected by the environmental cost variables. This result supports Cortez (2011, 2012) conclusion in his researches of Japanese



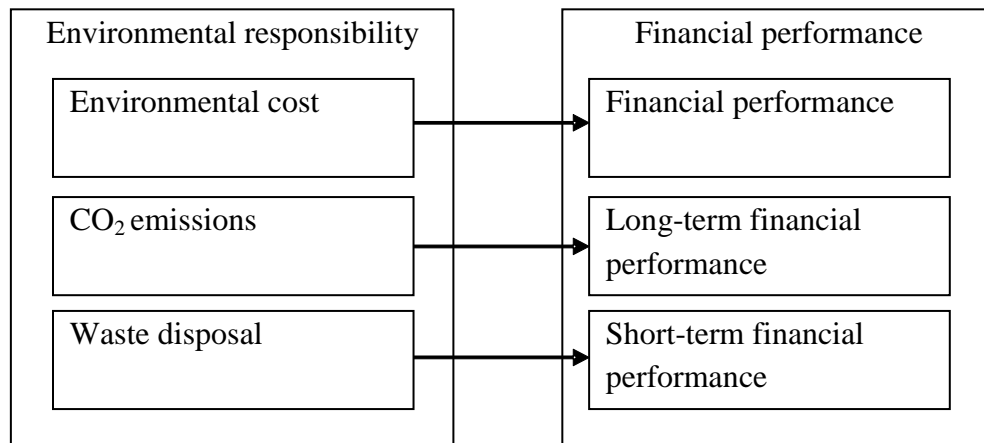
automotive, electronics, and chemical companies. The result is justified by the business rationale of sustainability which mentioned by Orlitzky (2008) and Kurucz, et.al (2008), the resources-based view perspective exists that Japanese automotive companies statistically gain more benefits of environmental cost on its financial performance.

On the other hand, CO<sub>2</sub> emissions in Japanese automotive companies only impacts to the cost of sales, stock price, and total assets. The result supports Iwata and Okada (2011) argument of the greenhouse gas reduction has significant influence to the long-run financial performance and has less effect on the short-term financial performance. In this research, stock price, as a proxy for long-run financial performance, proved their argument. The results also consistent with Bose & Pal's (2012) results that company's stock price positively affected by the green supply chain management. Needless to say that companies action in the reduction of greenhouse gas performance would affects positively to the company sustainability. Good gas emissions management would increase shareholders expectation of the companies' continuity. Moreover, cost of sales reacts positively to the CO<sub>2</sub> emissions, means that lowering greenhouse gas emissions would reduce the cost of sales of the companies. Keizai Doyukai (2010) explained that greenhouse gas management becomes the focus of companies' consideration on

environmental problems for the reasons that complaints from community would increase cost of sales of the companies. Lastly, total assets of Japanese automotive companies would increase because of the greenhouse gas management.

The waste disposal management seems to have different behavior with the CO<sub>2</sub> emissions management in automotive companies. Waste management positively affects to revenues, net income, EPS, and total assets. It is obvious to see that while greenhouse gas management impacts on the long-term financial performance, waste management significantly impacts to short-term financial performance. Keizai Doyukai (2010) mentioned that the amount of waste produced by a company might be disposed or sold. Consequently, it will increase revenues, net income, and EPS of the companies. Therefore, improvement in short-term financial performance from waste disposal management has a high possibility in the manufacturing industry.

Considering the hypothesis of environmental responsibility impacts on financial performance as shown in figure 7.1, hypothesis h1a should be accepted between environmental cost and financial performance, CO<sub>2</sub> emissions and long-term financial performance, and lastly, waste disposal and short-term financial performance.



**Figure 7. 10** Environmental responsibility positively impacts on financial performance of Japanese automotive companies

### 7.1.2. Automotive spare-part companies

Automotive spare-part companies react differently with the automotive companies. Environmental cost variable influences revenues, cost of sales, EPS, stock price, and total assets. Revenues are expected to be positive as a legitimacy of environmental cost is converted into sales (Cortez, 2012a). EPS responds positively for the virtue of the shareholders requisite from the company performance. As the first tier of automotive industry green supply chain, automotive spare-part companies highly dependence on the automotive industry. Consequently, if automotive industry's environmental responsibility increases, automotive spare-part would follow to do similar action related to

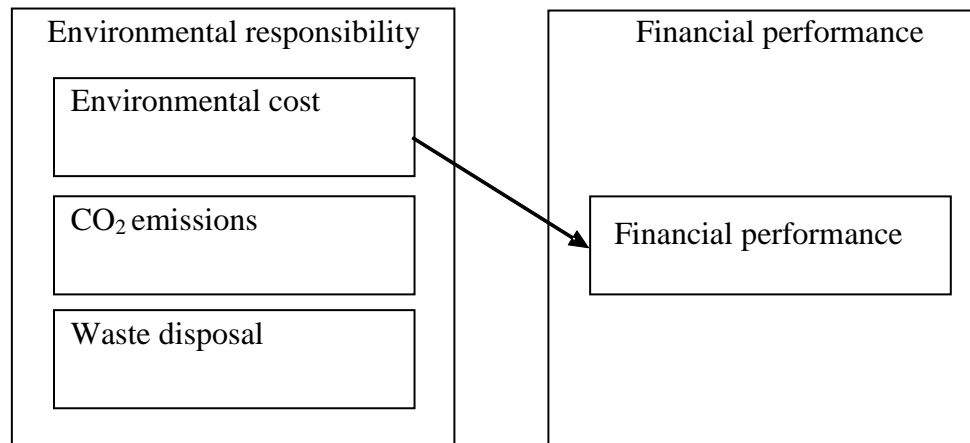
environmental responsibility by the virtue of isomorphism (Cortez, 2012b). Therefore, automotive spare-part shareholders would respond positively by the companies' action, which reflects on stock price.

The CO<sub>2</sub> emissions variable, statistically, does not affect automotive spare part companies' financial performance. Iwata and Okada (2011) stated that Japanese government regulates the abatement cost of pollutant to minimize negative effects of companies operations to the environment. Consequently, companies have to manage their gas emissions which required by the rules. However, it changes to be more companies' strategy instead of companies' obligation (Keizai Doyukai, 2009).

Regarding to waste disposal management, table 7.1 shows that waste disposal influences cost of sales and total assets of Japanese automotive spare-part companies. Similar justification with the automotive companies, waste disposal can be reuse or sold. Consequently, cost of sales would decrease as selling waste classified as reduction of cost of sales.

As a result, the hypothesis h1b: environmental responsibility impacts on financial performance of Japanese automotive spare-part companies should be accepted in relationship between environmental cost and financial performance. However, there is not enough evidence to

support the impact of greenhouse gas emissions management and waste management on financial performance in this industry.



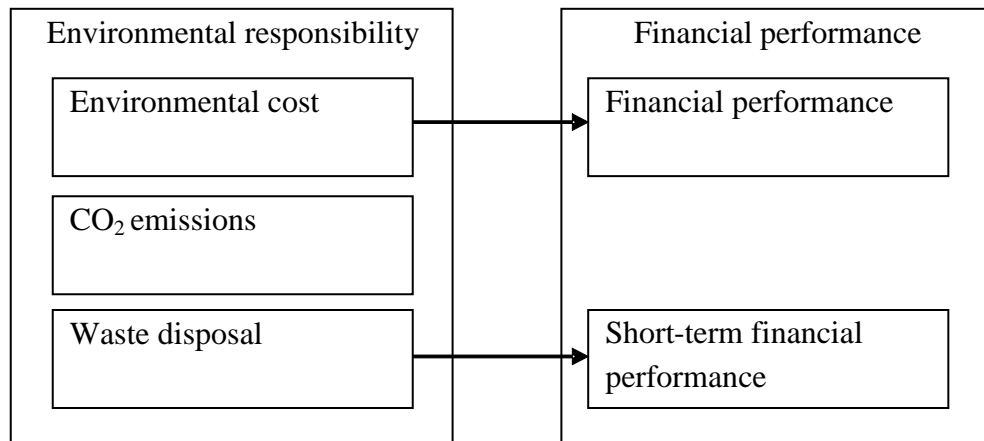
**Figure 7. 11** Environmental responsibility positively impacts on financial performance of Japanese automotive spare-part companies

### 7.1.3. Chemical Companies

Interestingly, as shown in table 7.1, statistical result of environmental responsibility impacts on financial performance of Japanese chemical companies almost similar with the one on Japanese automotive spare-part companies. The environmental cost influences revenues, cost of sales, EPS, stock price, and total assets; CO<sub>2</sub> emissions have no impacts to financial performance. The difference is the results of waste disposal management in chemical companies; more financial performances are affected by waste management; with cost of sales, net income, EPS, and total assets are the responding variables.

However, the result shows that cost of sales react positively to the waste disposal. This coefficient is expected to be negative because of cost of sales should be decrease by environmental responsibility of the companies. Cortez (2012) revealed the similar results on his research. He concluded that the positive relationship suggests the environmental responsibility do not necessarily production becomes more efficient.

Therefore, the hypothesis h1c: environmental responsibility impacts on financial performance of Japanese chemical companies should be accepted in relationship between environmental cost and waste disposal to financial performance. However, there is not enough evidence to support the impact of greenhouse gas emissions management on financial performance in this chemical companies.



**Figure 7. 12** Environmental responsibility positively impacts on financial performance of Japanese chemical companies

Exploring the impacts of environmental responsibility on the financial performance in three industries in Japan interestingly comes out with different results. In automotive companies, the impacts almost occurred in every variables while in the other two industries, CO<sub>2</sub> emissions does not corresponding with financial performance. Based on the resources-based-view perspective, this result justified company's behavior in doing green business and finally achieve better financial performance. However, beside the monetary achievement, government regulation also affects to the obedience of companies' environmental responsibility, which is not explored in this research.

## **7.2. Financial performance impacts on environmental responsibility**

In the previous section, the resources-based view perspective was explored using environmental responsibility as an independent variable and financial performance as dependent variable (Cortez, 2012; McGuire, et. al, 1988; Waddock & Graves, 1997). Subsequently, the relationship is reversed; financial performance becomes an independent variable and environmental responsibility is the dependent variable. This relationship aims to investigate the existence of slack availability of resources perspective in Japanese manufacturing companies. Therefore, three variables of environmental responsibility: environmental cost, CO<sub>2</sub> emissions, and waste disposal management, examine together with eight financial performances: revenues, cost

of sales, net income, EPS, ROA, ROE, stock price, and total assets in Japanese automotive industry, automotive spare-part industry, and chemical industry. The summary of the results are explained in the following.

	Automotive			Spare-part			Chemical		
	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste
Revenues	O	X	O	O	X	O	O	X	O
Cost of sales	O	O	X	O	X	O	O	X	O
Net income	O	X	O	O	X	X	O	X	X
EPS	O	X	O	X	X	X	O	X	X
ROE	O	X	O	X	X	X	X	X	X
ROA	O	X	O	X	X	X	X	X	X
Stock price	O	X	X	O	X	X	O	X	X
Total assets	O	X	X	O	X	O	O	X	O

Table 7. 6 Results summary of financial performance impacts on environmental responsibility

Source: Processed primary data, 2013

### 7.2.1. Automotive Companies

The results of financial performance positively impacts to environmental responsibility in Japanese automotive companies are shown in table 7.2. The result shows that all the financial performance statistically has positive impacts to companies' environmental cost, which support Cortez's (2011, 2012) results. By the virtue of slack availability of resources, the financial performance determines the amount of environmental cost allocated by the companies (Cortez, 2012).

On the other hand, only cost of sales has a significant influence on CO<sub>2</sub> emissions in Japanese automotive companies. Increase in cost of

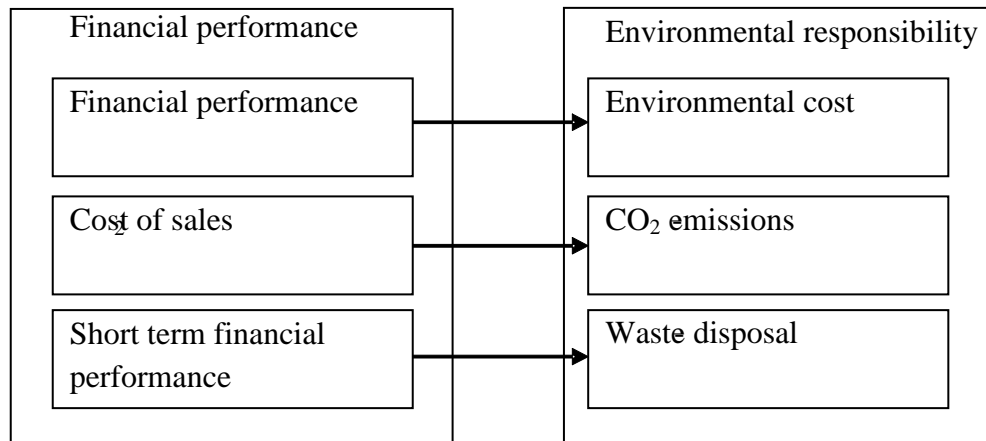


sales in the contrary decrease the CO<sub>2</sub> emissions as the coefficient is negative. This result shows that companies perform reduction of greenhouse gas and allocate the cost into cost of sales. Combines with the previous result, cost of sales was react positively to the CO<sub>2</sub> emissions, which means that lowering greenhouse gas emissions would reduce the cost of sales of the companies. Apparently, it creates a bi-directional relationship between the variables, which will be explored later in this chapter.

The waste disposal management has higher positive influence from financial performance. In table 7.2, revenues, net income, EPS, ROE, and ROA are significantly affects companies' waste disposal management. Keizai Doyukai (2010) mentioned that the environmental responsibility for each company is different. It is based on the type of the company, for example manufacturing company would perform environmental responsibility better than service company, and also the size of the company. Interestingly, waste disposal management in Japanese automotive companies are not affected by the size of the company but affected by the short-term financial performance. The short-term financial performance utilized by the company to increase waste management system. In Japan, as the CSR tends to focus on environmental action, managing disposal waste becomes one of their

goals; therefore, the companies need to invest or spend more money for it.

Considering the hypothesis of financial performance impacts on environmental responsibility as shown in figure 7.4, hypothesis h2a should be accepted between financial performance and environmental cost, cost of sales and CO<sub>2</sub> emissions, and lastly, short-term financial performance and waste disposal.



**Figure 7. 13** Environmental responsibility positively impacts on financial performance of Japanese automotive companies

### 7.2.2. Automotive Spare-part Companies

In the automotive spare-part companies, the results of financial performance positively impacts to environmental responsibility are less significant than the one in automotive companies. Revenues, cost of sales, net income, stock price, and total assets are positively impact the

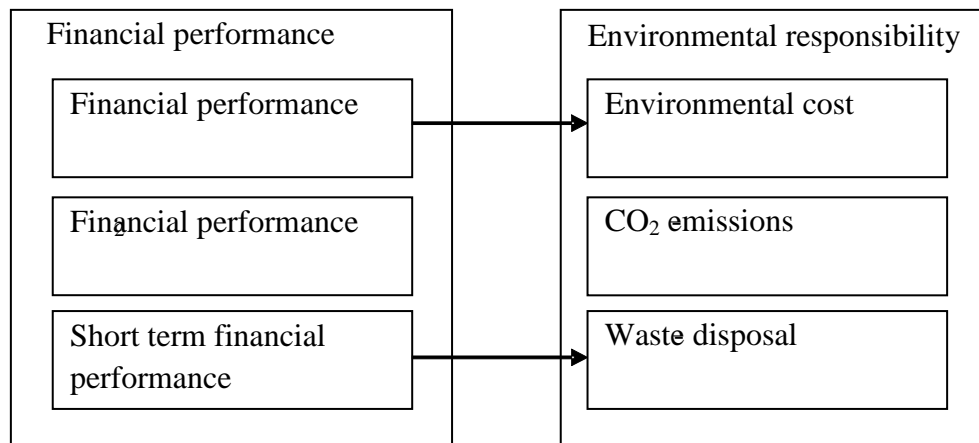
environmental cost; revenues, cost of sales, and total assets positively influence companies' waste disposal. On the other hand, no evidence that supports CO<sub>2</sub> emissions is influenced by financial performance.

Environmental cost in Japanese automotive spare-part companies correspondent with the financial performance except the shareholders perspective, which reflected in EPS, ROE, and ROA. It seems that shareholders believe that environmental cost would decrease their wealth. Looking back to the earlier CSR evolution, shareholders tend to neglect the social responsibility and consider the activity as a mandatory activity. Captivatingly, even though ROE and ROA does not influences environmental cost, stock price as a proxy of long-term profitability sees from the shareholders positively affects on environmental cost. Therefore, there is a high possibility of bi-directional relationship that will be explored later.

Regarding to waste disposal management, three financial performances: revenues, cost of sales, and total assets are significantly affects the waste disposal management. It is obvious that companies have to be positive financially before perform waste management. However, since the regulation of waste management in Japan was released and mandatory for manufacturing company, they have to do

environmental activities. This also related to the relationship between financial performance and CO<sub>2</sub> emissions management.

As a result, based on statistical results in figure 7.3, hypothesis h2b should be accepted between financial performance and environmental cost, and short-term financial performance impacts on waste disposal.



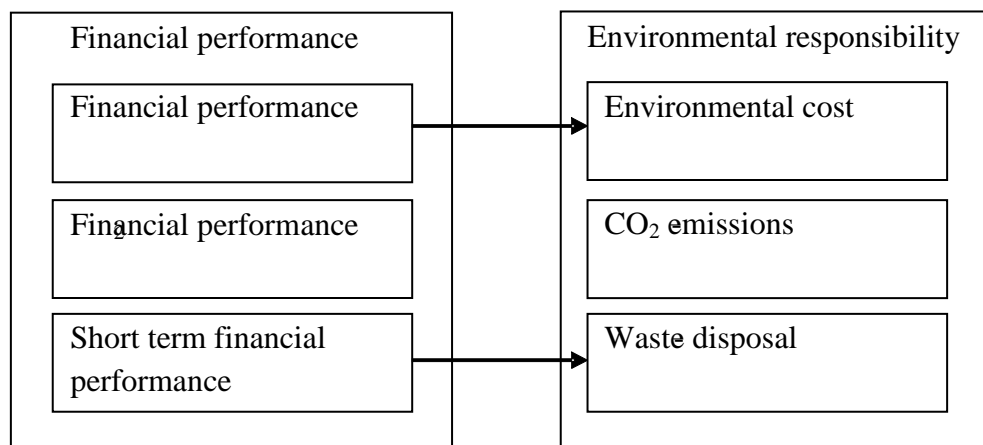
**Figure 7. 14** Environmental responsibility positively impacts on financial performance of Japanese automotive spare-part companies

### 7.2.3. Chemical Companies

In the chemical companies, almost all the variables of financial performance have significant relationship with environmental cost. This result supports Cortez (2012) in his research on Japanese chemical companies' for the period 2001 to 2010. However, similar with the automotive spare-part companies, the results of financial performance positively impacts to waste disposal and greenhouse gas emissions are

less significant compare with the environmental cost. Again, these results are almost similar with Iwata and Okada in 2011.

Therefore, financial performance impacts on environmental responsibility as stated in hypothesis h2c should be accepted only for the relationship between financial performance and environmental cost, and short-term financial performance impacts on waste disposal.



**Figure 7. 15** Environmental responsibility positively impacts on financial performance of Japanese chemical companies

The impacts of financial performance on the environmental responsibility in three industries in Japan were explored in this research. In automotive companies, the impacts almost occurred in every variable, while in the other two industries, CO<sub>2</sub> emissions does not fully influenced by financial performance. Based on the slack availability of resources

perspective, companies doing environmental responsibility based on their resources capability.

### 7.3. Virtuous cycles between financial performance and environmental responsibility

Using granger causality test to determine direction between financial performance and environmental responsibility reflects the existence of virtuous cycle in Japanese manufacturing industries. The summary of the results are as the following.

	Automotive			Automotive spare-part			Chemical		
	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste	EC	CO <sub>2</sub>	Waste
Revenues	O	O	X	X	X	X	X	X	X
Cost of sales	O	X	X	X	X	X	X	X	X
Net income	X	O	X	X	X	X	X	X	X
EPS	O	X	X	X	X	X	X	X	X
ROE	X	O	X	X	X	X	X	X	X
ROA	X	O	X	X	X	X	X	X	X
Stock price	X	X	X	X	X	X	X	X	X
Total assets	X	O	X	X	X	X	X	X	X

Table 7. 7 Results summary of virtuous cycles between financial performance and environmental responsibility

Source: Processed primary data, 2013

Table 7.3 shows the summary of virtuous cycles in Japanese manufacturing industries. Following Cortez's (2011, 2012) work, determining whether the

result is significant or not, noted by virtuous cycles equal or more than 50%.

Descriptions of each industry is as the following.

### **7.3.1. Automotive companies**

The result shows that virtuous cycle exists between in financial performance and environmental cost. Interestingly, the bi-directional relationship also resulted from granger causality shows equal results between of financial performance impact to environmental responsibility (100% of the observations) and environmental responsibility impacts to financial performance (100% of the observations). It seems that the resources-based view perspective and slack availability of resources perspective are coupled in environmental cost and financial performance relationship; then creates a virtuous cycle.

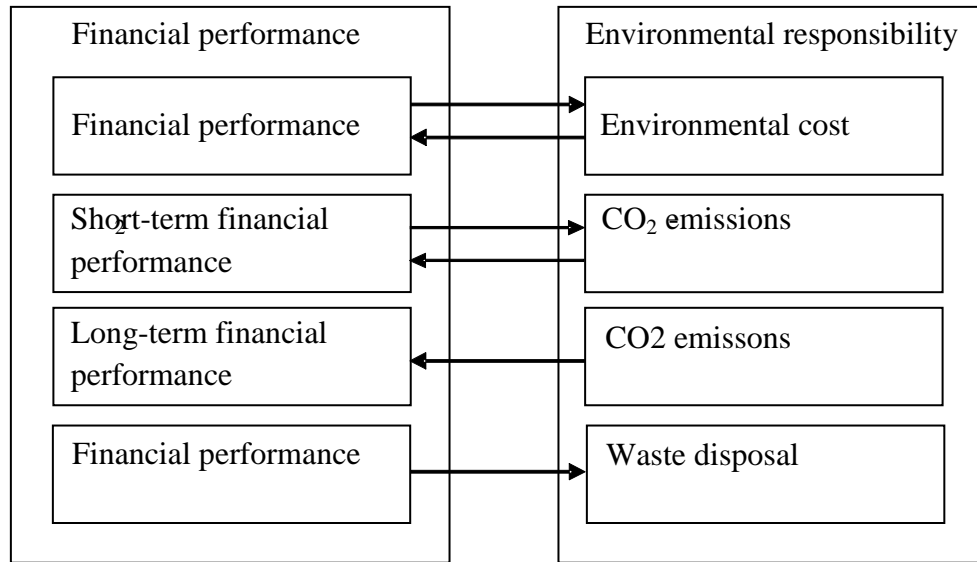
The next investigation is the CO<sub>2</sub> emissions and financial performance relationship. The result shows that revenue, net income, ROA, ROE, and total assets are granger cause with the CO<sub>2</sub> emissions. Moreover, other financial performances: cost of sales, EPS, and stock price support more on the resources-based view perspective rather than slack availability of resources This result is reasonable because Japanese regulation related to CO<sub>2</sub> emissions has been exist more than a decade. Recently, the management believe that managing greenhouse gas

emissions offer more financial benefits., such as tax reduction, sales increase, and lower complaint from the community.

Lastly, waste disposal management responds to financial performance in granger causality shows that no virtuous cycle exists in this relationship. Observably, it is supports more slack availability of resources perspective. Therefore, Japanese automotive companies tend to be profitable companies first before engaging in waste disposal management. Moreover, considering the result is notably high in stock price, it seems that future companies' expectation highly significant to the waste disposal management.

As a result, H3a is accepted in the case of environmental cost and financial performance, is conditionally accepted between CO<sub>2</sub> emissions and financial performance, and is rejected in the relationship of waste disposal and financial performance. However, a more powerful result is the waste management supports the slack availability of resources perspective while the CO<sub>2</sub> emission supports the resources-based view perspective. The latter result conforms Cortez and Nugroho (2011) conclusion that based on a perception survey of Japanese management, appreciation to the resources-based view perspective is higher as sales, profit, and shareholder wealth maximization are concerned (Cortez, 2012).





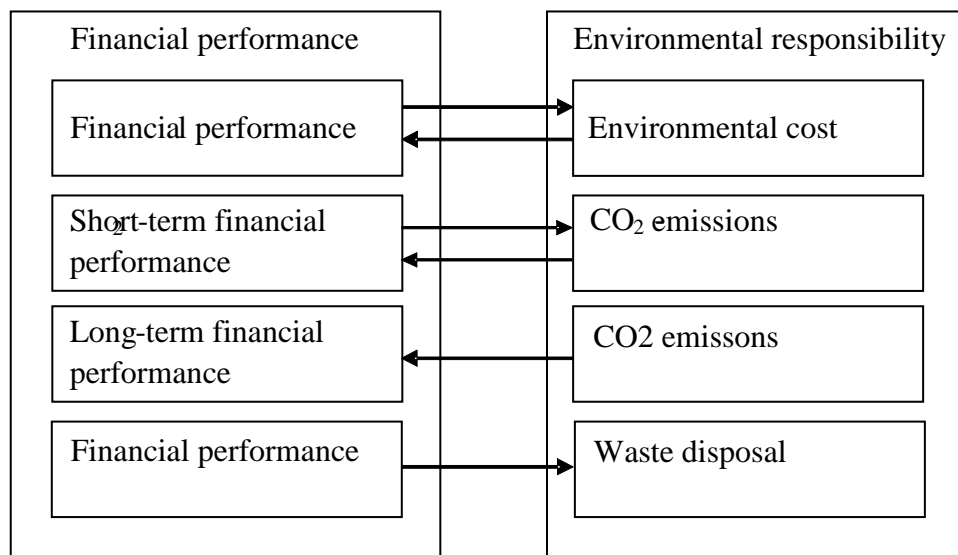
**Figure 7. 16** Relationship direction between financial performance and environmental responsibility of Japanese automotive companies

### 7.3.2. Automotive spare-part companies

In the Japanese automotive spare-part companies, there is not enough evidence to support virtuous cycles between financial performance and environmental responsibility as shown in table 7.3. Moreover, there is less evidence to explore the direction of environmental performance to/from financial performance as there were no results equal to 50% or above. This result contradicts with the hypothesis; therefore H3b should not be accepted.

A noteworthy investigation from this result is the influences of automotive companies to the automotive spare-parts companies are exist. The green supply chain management push the spare-part companies to be

dependent to the automotive companies. By the virtue of network theory (Cortez, 2010), automotive companies would require high requirements, in order to create a green product, to their suppliers. As a matter of this, the impact of Japanese automotive companies on the Japanese automotive spare-part companies will be explored in the latter part.



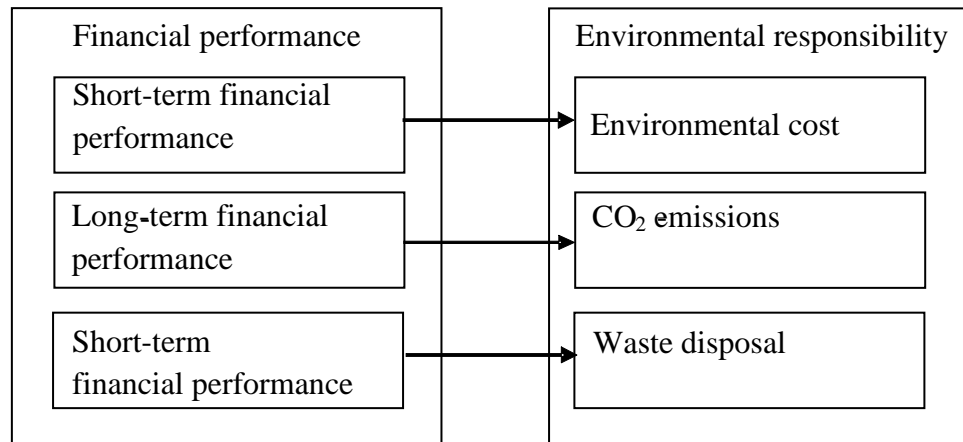
**Figure 7. 17** Relationship direction between financial performance and environmental responsibility of Japanese automotive spare-part companies

### 7.3.3. Chemical companies

As shown in table 7.3, in the Japanese chemical companies, there is no supporting evidence to support virtuous cycles between financial

performance and environmental responsibility; therefore, H3c is not acceptable. On the other hand, statistical result shows the direction between financial performance and environmental cost supports slack availability of resources.

The financial performance and CO<sub>2</sub> emission relationship in this industry also reflect the slack availability of resources, as the financial performance impacts on environmental responsibility are greater with the reversed one. Similar results also found between the financial performance and waste disposal management.



**Figure 7. 18** Relationship direction between financial performance and environmental responsibility of Japanese chemical companies

#### 7.4. Automotive industry impacts on automotive spare-part industry

Green supply chain in Japanese manufacturing tested between automotive and spare parts industry revenue as controlling variables and revenues of

chemical company as dependent variables. The result shows a significant impact by p-value of 0.0000303. Therefore, automotive and spare part industry's revenues positively influence revenue of chemical companies. Therefore, H4b also accepted.

These results in line with Cortez (2011) which mention that automotive industry's requirement of environmental friendly products followed by spares parts industry because of institutional isomorphism.

#### **7.5. Automotive industry and automotive spare-part industry impact on chemical industry**

Green supply chain in Japanese manufacturing tested between the automotive industry revenue as controlling variables and revenues of spare parts and chemical industry as dependent variables. The result shows a significant impact by p-value of 0.0000505 and 0,0000401. As a matter of business, this result is highly expected. The automotive industry should be triggering the revenue of its supplier. Therefore, H4a is accepted that the automotive industry performance affects positively to financial performance of spare parts industry.

## 7.6. Theoretical Implications of Study

The relationship between environmental responsibility and financial performance explore as discussed in the previous section, has several results to be discussed which summarized in Table 7.4.

Hypotheses	Industry	Financial Performance	Environmental responsibility		
			Environmental cost	CO2 emissions	Waste disposal
<i>Environmental performance impacts on financial performance</i>					
H1a	Automotive	Financial Performance	Accepted	Long-term FP	Short-term FP
H1b	Spare-parts	Financial Performance	Accepted	Rejected	Rejected
H1c	Chemical	Financial Performance	Accepted	Rejected	Short-term FP
<i>Financial performance impacts on environmental responsibility</i>					
H2a	Automotive	Financial Performance	Accepted	Cost of sales	Short-term FP
H2b	Spare-parts	Financial Performance	Accepted	Rejected	Short-term FP
H2c	Chemical	Financial Performance	Accepted	Rejected	Short-term FP
<i>Virtuous cycle between financial performance and environmental responsibility</i>					
H3a	Automotive	Financial Performance	Accepted	Accepted	Rejected
H3b	Spare-parts	Financial Performance	Rejected	Rejected	Rejected
H3c	Chemical	Financial Performance	Rejected	Rejected	Rejected

<i>Automotive companies impacts on spare-parts and chemical companies</i>	
H4a	Accepted
<i>Automotive and spare-parts companies impacts on chemical companies</i>	
H4b	Accepted

Table 7. 8 Summary of hypotheses

Source: Summary of processed primary data, 2013

The table shows the summary of all hypotheses proposed in this research. Automotive companies have the most number of virtuous cycles in the relationship of environmental cost and financial performance and slack availability of resources in the CO<sub>2</sub> emissions and waste disposal management. In the automotive spare-parts and chemical companies, slack availability of resources dominantly affects the relationship between financial performance and environmental responsibility. The automotive companies are more liable with the public perception of green products, which translated into their financial performance. In contrast, as the automotive spare-parts companies are the supplier of the automotive companies while chemical companies apparently become the upstream industry of those industries, the positive link between those industries are investigated through multivariate regression analysis.

The virtuous cycles justify the reason of companies perform environmental responsibility whilst improving financial performance equally. Based on the statistical results, more automotive companies believe that engaging an

environmental responsibility increase revenue and in the then generate new resources to perform better environmental responsibility. The arguments of the reason based on the possibility of sales increase because of eco-friendly products creation, such as hybrid cars and low emissions cars. These cars have been a niche market in cars market, particularly after the Japanese government supports it through subsidy and tax reduction. Hence, the cycling usage of revenues reflects the improvement of earning-per-share. As a proxy of shareholders wealth, it is believed that cost allocated for environmental purposes increase the shareholders wealth and then reversed direction to affects the environmental cost performance, as similar with the revenues.

In the earlier adaptation of environmental accounting, the perception of environmental cost was a burden instead of investment. Throughout the years, it changes to a voluntary basis because they believe that managing environmental is part of companies' strategy. It is shows from the results of other financial performance in the automotive industries to the environmental cost relationship. Most of the relationship supports on the resources based view perspective; means that management believes managing a better environmental responsibility significantly impacts the financial performance.

Regarding to the CO<sub>2</sub> emissions and financial performance relationship in the automotive industry, the equal bi-directional relationship exists in the relationship of revenue, net income, ROA, ROE, and total assets, since statistical

results shows positive results in equal or above 50% of the observations. This result is highly expected considering the automotive industry CO<sub>2</sub> emissions regulation in Japan. The regulation gives extra incentives to the “greener” automotive companies by providing incentives for cars buyers and tax reduction for the cars makers. This regulation becomes a stimulus for automotive companies to perform better environmental practices, which indirectly would increase their financial performance. However, since this research does not explore the effect of regulation in the observations, the more analysis among three aspects: financial performance, environmental responsibility, and regulation explored deeply to enhance the analysis of the relationship.

For the waste disposal management and financial performance, statistically, there is not enough support to accept the virtuous cycle. On the other hand, the result shows that slack availability of resources perspective affects more than the resources based-view perspective. This means that waste management performance of automotive companies determined by the resources of the companies. This is reasonable knowing that the amount of investment of managing waste is immense compare to the results. After all, the relationship exists between these two variables which more supported by the slack availability of resources.

Different with the automotive companies, statistical results show that in the automotive spare-parts companies and chemical companies, evidence to support



the virtuous cycles hypotheses are less than in the automotive companies. The results tend to support the slack availability of resources in both observed industries.

The relationship of environmental cost and financial performance in the automotive spare-parts companies shows a low correspondence in all variables. Having no independency with the automotive industry, the automotive spare-parts engage in environmental responsibility based on the virtue of network theory. Automotive industry requires a necessary products specification to create eco-friendly products. Thus, automotive spare-parts industry has to answer the challenge by allocating more resources to provide “greener” products to meet the specification.

On the other hand, automotive spare-parts companies have to manage their CO<sub>2</sub> emissions based on the regulation, customers, and public expectation. The CO<sub>2</sub> emissions reduction can trigger an improvement in financial performance; or profitability might be allocated for CO emissions management. The results show that the latter possibility is more suitable for automotive spare-parts companies.

## **CHAPTER 8**

### **CONCLUSION**

Environmental responsibility has become an essential part of management practice. The increasing number of engagement of environmental responsibility in companies shows the role of it becomes more significant. Therefore, the need of uniformity of the standard should not be neglected for comparability purpose. In order to standardize the environmental responsibility report, in Japan, an environmental accounting guideline was established. The presence of this guideline helps companies to plan, manage, and evaluate their environmental responsibility, measure the impacts and benefits from the actions, and accessing the weakness for improvement.

As the matter of measuring impacts and benefits, this research aims to explore the relationship between environmental responsibility and financial performance in three manufacturing industries: automotive, automotive spare-parts, and chemical industry, which comprise manufacturing sectors in Japan. Furthermore, by selecting these industries, an effort to examine the green supply chain management of the automotive industry in Japan is intended.

As sustainability study needs a long-run observation, a decade data observation should convince enough to portray a bigger picture in examining the relationship.

## 8.1. Conclusion

Based on the analysis and discussion in the previous chapters, this sub-chapter tries to answer the research questions of this research. The summaries of conclusions of the answers are as the following.

1. Statistical analysis suggests the existence of the relationship between environmental responsibility and financial performance in the Japanese automotive automotive spare-parts, and chemical companies.
2. Among three manufacturing industries observed, automotive companies exhibit the most virtuous cycle in the relationship of financial performance and environmental cost while other industries show evidence to support the slack availability of resources.
3. CO<sub>2</sub> emissions and waste disposal management as environmental responsibility proxies, advocates the mix results on the unidirectional impacts on financial performance and vice-versa. However, statistical finding supports more on slack availability of resources rather than the resources-based view perspective. Conversely, as practiced in the automotive companies for more than a decade, other variables of environmental responsibility support the resources-based view perspective.
4. In the relationship between CO<sub>2</sub> emissions and financial performance, statistical results imply the long-term financial performance affects

companies' CO<sub>2</sub> emissions reduction. On the other hand, waste disposal management affected by the short-term financial performance.

5. In the green supply chain management, statistically, the results conform to the green supply chain theory. The automotive companies have significant impacts on automotive spare-parts companies and chemical companies. A similar result exists in the impacts of automotive companies and automotive spare-parts companies on chemical companies. These results set the chemical companies as the upstream industry that supports automotive industry and automotive spare-parts industry.
6. The background of companies' engagement into environmental responsibility is started with self-regulation, encouraged by the regulation, standards, and best practice, nourished by the virtue of network theory, and sustained by the direct benefit obtained from the environmental responsibility operations as proposed by both resources-based view perspective and slack availability of resources. Therefore, it is obviously understandable that the background of companies' engagement in environmental responsibility might different among companies.

## **8.2. Future Research**

This research utilized 10 years data of the automotive industry, automotive spare parts, and chemical companies' environmental cost, CO<sub>2</sub>

emissions, and waste disposal as variables of environmental responsibility, while revenues, cost of sales, net income, earning-per-share, return on assets, return on equity, stock price, and total assets as proxies of financial performance. Because of the limitation of observation and explored variables, some suggestions for future research are as the following.

1. Sustainability study needs a longer period of observation because of investment related to environmental responsibility would not effective in the short period. As a result, longer period observation is needed to illustrate a better research. Therefore, observing more years' data would be more suitable.
2. The advantage of using purposive sampling is the uniformity of data able to be obtained; however, increasing the number of observation would describe a bigger picture of Japanese manufacturing industry.
3. Environmental accounting standard in Japan classified environmental cost into six different costs. Conducting a research in the six cost categories, the behavior of the companies engaging environmental responsibility will be depicted more clearly.
4. Yelkikalan and Koes (2012) argue that the financial crisis has a significant impact on companies' environmental responsibility and financial performance. Therefore, considering the impacts of financial crises in future

research would beneficiary to be observed, as Cortez's (2011) did in his research.

5. In Japan, a complex interrelated and interconnected business exists or affects in the business system (Cortez, 2012). This complex system called as *keiretsu*. Therefore, from a sociological perspective, exploring the companies' reasons for conducting environmental responsibility are based on the regulation, network theory, and institutional isomorphism (Cortez, 2011). As a result, observing these three theories would broaden the range value of research.

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